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Chief, Rules and Directives Branch
Division of Administrative Services
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U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

RE: Shieldalloy Metallurgical Corporation (SMC) Decommissioning Plan, Rev. 1a

The New Jersey Department of Environmental Protection (NJDEP) has received and reviewed the Decommissioning Plan, Revision 1a (DP) for the Shieldalloy Metallurgical Corporation. NJDEP has found that the DP requires major revision based on the following comments.

GENERAL COMMENTS

1. The DP is not a cohesive package. It took a considerable amount of time to piece together the Revision 1a sections into the Revision 1 document. Even after assembling the portions, the sections were still out of order because of the way the new material was printed (double-sided non-consecutive sections). Any subsequent revisions must be submitted as a comprehensive, stand-alone document that should not have to be pieced together by interested parties.

2. The site has not been sufficiently characterized to determine the levels of radioactivity above background. The soil samples were sporadic and the USEPA protocol for further analysis of water samples was not followed properly. The laboratory data was either not present, or had problems, like not meeting the required minimum detectable activities (MDA) or missing the uncertainty data. For example, there is no indication if soil samples were sealed for 21 days prior to analysis in order to reach secular equilibrium. This could bias all the soil results low. Sufficient characterization of the radiological constituents is necessary to determine if the survey unit classifications in Figure 18.11 are adequate. The survey unit classifications determine the spacing of sampling points in the final status survey. If a survey unit classification is underestimated (Class 2 instead of Class 3), then contamination above the established cleanup levels could be missed.

E-RIDS= ADM-03
Add = K. Kalman (KLK)
Y. Suber (EXS)

SUNSI Review Complete
Template = ADM-013

3. It is not clear that there has been a correctly performed eligibility determination made in the DP in accordance with 10 CFR 20.1403(a). In its response to comments on NUREG 1757, the NRC states that the NRC would not approve an LTC license option for a site that did not comply with the eligibility requirements in 10 CFR 20.1403(a). This should have been reviewed and accepted as accurate before the NRC continued with the LTC process.

4. The benefits of unrestricted use versus restricted use should include the Regulatory Costs Avoided (NUREG 1757, Vol. 2, p. N-6). Included in these costs are additional licensing fees to develop an Environmental Impact Statement (EIS) and costs associated with public meetings, to name a few. Because NRC has already held two public meetings and started the EIS process, these costs can not now be avoided. The NRC has violated its own guidance by conducting these meetings and starting the EIS process without first determining if the site complies with the requirements in 10 CFR 20.1403(a). For more details, please refer to NJDEP's comments on Section 7 , below.

5. It is imperative that the NRC coordinate with the NJDEP and USEPA on remediation of this Superfund Site. The DP practically ignores the fact that chemical contamination exists in the soil, ground water, surface water and sediments at and emanating from the site in addition to the radioactive contamination. The DP fails to acknowledge that both types of contamination must be remediated in a manner that does not exacerbate the extent of the other. Statements in the DP that claim that the ground water pathway can be ignored in the dose assessment because it is already contaminated or that "NJDEP regulated soil materials" may be buried under the proposed engineered barrier without demonstrating that they will not be a continuing source of contamination (especially since the proposed barrier is permeable and unlined), are just examples of SMC's compartmentalization of the environmental issues in the DP.

6. SMC previously excavated soil that exceeded NRC unrestricted release criteria and stockpiled it in the NRC-regulated storage yard. SMC has not, however, documented the concentrations of the metals and other non-radioactive contaminants in the stockpiled soil to see if it is hazardous waste or if it exceeds the NJDEP Soil Cleanup Criteria. NJDEP and USEPA do not approve remedial actions that allow a continuing source of contamination to remain unmitigated. It is therefore unlikely that NJDEP and USEPA would approve the on-site disposal of SMC's contaminated soil in an unlined landfill with an engineered barrier that allows infiltration of precipitation and flood water. NRC should not ignore this potential either. SMC shall document, through sampling and analysis by appropriate NJDEP and USEPA protocols, that the soil, and all other materials that may be consolidated under the engineered barrier, do not represent a continuing source of contamination.

7. When references are cited, such as the Draft Feasibility Report for the determination of density and hydraulic conductivity of the slag, the volume and page should also be referenced. This is done throughout the DP, reports are given as reference, but the details on exactly where the information is located is not included. The DP shall be revised to provide more accessible cross-referencing.

8. NJDEP also refers to NJDEP's Petition for Hearing on the Shieldalloy Metallurgical Corporation Decommissioning Plan dated January 16, 2007 for additional comments and clarifications.

ENGINEERED BARRIER COMMENTS

9. A parametric or component sensitivity analysis to identify how much degradation of the engineered barrier would result in non-compliance was not performed as per NUREG 1757 Vol.2, Section 3.5.3.

10. SMC did not provide natural analogs for the effectiveness of their engineered barrier. NUREG 1757 uses Native American Mounds to demonstrate erosional stability, but states that the ability of the mounds to limit infiltration is unknown. It goes on to state that archaeologists have dated the mounds by excavating bones and artifacts from the mounds and determining the age of the object or the date of its burial. This is a perfect analog for human intervention (excavation) of an engineered barrier (Native American mound) which is reasonably foreseeable (it happened).

11. The type of soil that will be used for the cap was not specified. Therefore, the density, runoff coefficient and evapotranspiration coefficient cannot be known accurately. These parameters are required to accurately model the radiological impacts on groundwater.

12. Vegetation will be a problem for the engineered barrier as it is for all landfills. Whether vegetation takes hold immediately or over time as wind-born deposits of soil and seed are made on the landfill, the vegetation will grow and send roots down into the waste disrupting the cover and breaking down the deposited material and extracting some of it to the surface.

SPECIFIC COMMENTS

<u>Section 1 – Executive Summary</u>

1.5 Selection of Decommissioning Objectives

13. The DP conducts modeling for only 1000 years. However, this could be misleading to the public since the half-lives of the radionuclides are over a billion years. By not stating the half-lives of the radioactive materials in the DP, one could assume that the radiological hazard has completely decayed after 1000 years. SMC should conduct modeling for the amount of time that the materials remain a radiological hazard. See Hearing Request Contention No. 6.

1.6 Summary of Radiation Dose Analysis

14. The Multi-Agency Radiation Site Survey and Investigation Manual (MARSSIM) does not provide recommendations on determining Derived Concentration Guideline Levels (DCGLs) as indicated in footnote 3. Page Roadmap-1 of MARSSIM states "MARSSIM does not provide guidance for translating the release criterion into DCGLs." This must be corrected in the DP.

15. It is stated that the dose limit will be still be met in the "extremely unlikely situation when institutional controls will fail." Given the amount of time the slag pile will be radioactive, it is extremely likely that the institutional and engineering controls will fail. See Hearing Request Contention No. 5.

1.7 Summary of ALARA Analysis

16. SMC did not calculate the benefit of the averted doses, so it cannot determine if the LTC Alternative meets the first bullet listed: No practice shall be adopted unless its introduction produces a positive net benefit. SMC must calculate the benefit of averted doses pursuant to LTR 10 CFR20.1403(a) as part of their ALARA analysis.

Introduction

17. Page 3, lines 5-8 mentions Revision 0 of the DP. Since the NRC accepted Revision 1a, reference must also be made to Revision 1 (June 30, 2006).

Section 3 Facility Description

3.7.3 Ground Water Flow Direction, Velocities and Other Physical Parameters

18. The referenced report by Dan Raviv Associates in footnote 34 contains radiological analyses that do not conform to the requirements of reporting of radiological environmental data. For example, the MDAs should be reported for each analysis. The MDAs for gross alpha and gross beta are not always below the requirements in the Environmental Protection Agency's Safe Drinking Water regulations. (40 CFR 141.25(c) (1) and (2). The uranium concentrations reported are above that which would be expected in this area of the state. The concentration of uranium in the Kirkwood-Cohansey aquifer is typically 0.03 micrograms per liter (ug/L) according to the US Geological Survey[1]. Table 4 on page 31 of this USGS report lists the 90th percentile uranium concentrations for various geologic configurations (no Bridgeton Formation, with and without agriculture, and the Bridgeton Formation with and without agriculture). The range of the 90th percentile concentrations is 0.02-0.18 ug/L of uranium. This compares to 8.3 ug/L in Shieldalloy's well SC-11S and 16 ug/L in Shieldalloy's well SC-13S. Thus, uranium concentrations in the groundwater at the western edge of the disposal area (Appendix 19.2) are well above background. Further detailed comments on water data is presented below. Thus, subsequent statements in the DP that the radionuclides are bound tightly to the slag and will not leach into the groundwater, are not supported by SMC's own groundwater data.

Section 4 Radiological Status of the Facility

19. It is clear from the discussion in this section, that the SMC facility was never sufficiently characterized for radiological constituents. Given the fact that SMC confirms that the Hudson

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[1] **Kozinski, J., Szabo, Z., Zapecza, O.S, and Barringer, T.H.** ***Natural Radioactivity in, and inorganic Chemistry of, ground water in the Kirkwood-Cohansey Aquifer System, Southern New Jersey, 1983-89.*** **US Geological Survey Water-Resources Investigations Report 92-4144, West Trenton, NJ. 1995.**

branch is in need of remediation, other areas of the site must be sampled to ensure that radionuclides did not migrate from the areas that were licensed. Specific problems with Shieldalloy's site characterization data are illustrated in Appendix 19.6 of the DP. There, over 150 results are presented in a table. This table is taken directly from the IT report, Assessment of Environmental Radiological Conditions at the Newfield Facility, 1992. This is the report that SMC relies on for the characterization of the site. Yet the table and report omit supporting information that is required in order to consider the data valid, including the uncertainty, the accompanying laboratory data, the minimum detectable activities, and any indication whether the samples were sealed and held for 21 days.

20. The DP is required to sufficiently characterize the site. NUREG-1757 Vol.1 rev.2 pages 16-22 through 16-29. If the site is not properly characterized, then classification of survey units may be underestimated. Since classification determines the size of the survey unit, NUREG-1575, Rev. 1 page 4-15, and the percentage of scanning, NUREG-1575, Rev. 1 p.2-32, misclassification could result in releasing a survey unit when it does not meet the release criteria. "If a survey unit is classified incorrectly, the potential for making decision errors increases." NUREG-1575, Rev. 1 page 2-28. This can happen because the lower the classification, the larger the survey unit, the larger the distance between sample locations, and the less comprehensive the scan. NUREG-1575,Rev. 1 pages 4-15 and 2-32. Shieldalloy believes that the site has been fully characterized (DP § 14.1.1). Therefore, the NRC should require a comprehensive characterziation with valid data to ensure that the site is properly classified for the final status survey.

4.2.1 Ambient Gamma

21. A figure must be provided and referenced depicting the locations where these ambient measurements were taken. Are the 15 uR/h readings close to the storage yard?

4.2.2 Surface Contamination

22. A figure must be provided and referenced depicting the locations where these background measurements were taken.

4.2.3 Surface and Subsurface Soil

23. This section simply refers the reader toTable 17.2, which is just a listing of Radionuclide Concentrations (in picocuries per gram) without the associated uncertainties. Radiological data must always include the associated uncertainty. A measurement result and the uncertainty together allow one to place reasonable bounds on what the "true" value might be. "If the result of a measurement is reported without some indication of its uncertainty, the result is useless for decision making."[2]

4.4.1 Storage Yard

[2] Multi-Agency Radiological Laboratory Analytical Protocols Manual Part I Training Manual, Section 6.

24. This section only references the 1992 leachibility study. The September 26, 2005 leachibility study must also be referenced since it is presented in Appendix 19.4. The statement that "the physical form of the slag (glass-like rock) does not permit the radioactive elements to leach out into the regional water supply or local wetlands" is not true since SMC presents evidence that radioactive elements above background concentrations have gotten into the sediment and surface water of the Hudson Branch and are evident in the groundwater as well (Appendix 19.6 and Appendix 19.3). Also, the distribution coefficient for radium (Appendix 19.4) shows that it is capable of being leached from the slag.

25. Since SMC does not distinguish between naturally occurring radioactive materials (NORM) and technologically enhanced NORM (TENORM), to state that the uranium and thorium in the Haul Road slag was naturally occurring is misleading. The uranium and thorium in the high ratio slag is also naturally occurring in this context. Readings of 26 uR/h and 90 uR/h are not " only slightly discernible from background," as stated on page 27 of the DP. Footnote 53 does not take the geometry of the slag in the pile vs. the crushed slag on the road into consideration.

26. The paragraph on the radiation exposure from the slag pile is not adequate. A detailed map of exposure rate readings and locations must be included. The thermoluminescent dosimeter (TLD) data must be presented in the DP. This data is necessary to determine if the exposure rates used in the ALARA analysis are accurate.

4.4.2 Demolition Concrete

27. SMC states definitively that the only areas within the SMC property lines where residual radioactivity exists in surface soils, other than the Storage Yard, are the concrete pads that housed the former AAF and Flex-Klean Baghouses, D-111 and D-102/112. This statement is premature considering there has been no valid characterization of the property.

28. The scale drawing and map of soil and water sampling results in Appendix B of the Environmental Report (Appendix 19.9) shows contamination above background levels in the Hudson's Branch and outside the fence line, to the north of the storage yard, and in areas where licensed material was never stored or used. These areas must be addressed in the final status survey design of the site.

4.5 Subsurface Soil Contamination

29. There does not appear to be an accurate accounting of the locations of where slag may have been used as fill, nor is there an accurate assessment of whether or not the slag was radioactive. This is confirmed in footnote 69 (Section 4.7) which states that the potential radionuclide distribution and depth have not yet been characterized in areas where slag may have been used as fill. Considering this uncertain history, the entire site and the affected surrounding areas must be included in a final status survey.

30. The DP contains inconsistencies concerning the slag density. The slag density is given a value of 1.3 grams per cubic centimeter (g/cm^3) in footnote 64, but 2.8 g/cm^3 for the input into the

RESRAD code. The correct slag density must be justified and then used consistently throughout the DP and models.

31. The concentration assumed to be present in the fill slag is much higher than the NJDEP's Soil Remediation Standards for Radioactive Materials (N.J.A.C. 7:28-12). This would not be considered a nominal radionuclide content. The assumptions presented, including the curie content of 8.4 Curies of uranium and thorium, confirm that the entire site must be characterized.

4.6 Surface Water

32. The report cited in footnote 66 and pages 3-23 to 3-24 of the Environmental Report (Appendix 19.9) show that surface water has elevated concentrations of radionuclides. To state that surface water in the vicinity of the Newfield site does not exhibit elevated (above background) radionuclide concentrations is not true.

4.7 Groundwater

33. Footnote 67 refers to the upgradient Newfield well. In the memo referenced in footnote 68, the Newfield well is reported to have a Ra-228 concentration of 6.39 pCi/L (the uncertainty is not provided). The Bureau of Safe Drinking Water has data on the Newfield well going back several years. At no time did the concentration of Ra-228 exceed 2.4 pCi/L. Since the laboratory data is not provided, it is difficult to determine whether the data is valid. There are many problems with the memo referenced in footnote 68. They are discussed in the comments below on Appendix 19.9, the Environmental Report.

34. Since the baghouse dust and contaminated soil and building debris were not analyzed to determine the distribution coefficient, it is not known if the radionuclides in these materials are soluble or insoluble.

Section 5 Dose Modeling Evaluations

5.1 Assessment Methodology

35. Table 5.1 referenced in footnote 81 could not be located in the DP. Table 5.1 must be provided for review as part of the DP.

36. It is misleading to state that an all controls fail scenario is being modeled (page 34, Rev. 1a, line 20). It must be made clear that what is actually being modeled in the DP is a slight degradation of controls. Since the materials will remain a radioactive hazard into perpetuity, NJDEP believes that modeling must be performed that includes the assumption that the engineered controls completely degrade.

5.2.1 Source Term

37. The lateral and vertical extent of contamination has never been determined (See Attachment 1). Accurate dose modeling of radionuclide contamination into the groundwater cannot be

conducted without determining the vertical extent of the contamination. Also, without a determination of the lateral extent of the contamination, contamination above the established cleanup levels could be missed in the final status survey.

5.2.1.2 Values Used to Describe the Restricted Area Source Term

38. The Derived Source Term using the weighted averages of the concentrations of material in the storage yard (Table 17.7) would make sense if the material were capable of being blended together. The concentration in the slag will not change even if other, less concentrated material is placed near it. If the slag were uncovered, as would be the case in an all controls fail scenario, it is reasonable to assume that the receptor would be exposed to the higher concentration, not the derived concentration. Thus, the Derived Source Term must use the concentration of the slag.

5.2.2.2.1 Engineered Barrier Layer

39. This revised section indicates that there will be a geomembrane, but in the response to comment letter to the NRC dated June 30, 2006, SMC maintains that the geomembrane has been removed from the design.

40. See comments from Appendix 19.3

5.2.2.2.2 Contaminated Zone Layer

41. Testing for distribution coefficients (K_d) indicates that Radium is not tightly bound and will tend to leach into the groundwater. It is unknown what the distribution coefficients are for the baghouse dust, contaminated soil and building debris since they were not provided in Appendix 19.4.

5.2.2.2.3 Undisturbed Surface Layer

42. The letter referenced in footnote 98 could not be located in either the DP or the NJDEP files. This document must be provided in the DP.

5.2.2.2.4 Saturated Zone Layer

43. This section states that the ground water is not potable and not likely to be ingested by anyone at the site. This statement is no true. In accordance with N.J.A.C. 7:9C–1.5(e), the aquifer beneath the site is classified as Class IIA. The primary designated use for Class II-A ground water shall be potable water and conversion (through conventional water supply treatment, mixing or other similar technique) to potable water. Class II-A secondary designated uses include agricultural water and industrial water. In the dose assessment treatment must considered a control that will fail. For these reasons and others outlined through this letter, SMC shall include the drinking water pathway in the all controls fail analysis.

44. No sorption tests were performed to verify that the underlying soil formations exhibit adsorption capacity for the contaminants of concern. Despite the DP's assigning a sorption value to the underlying soil formations that is equal to the waste material itself, the nature of the underlying soils consisting primarily of sand, gravel, and little to trace silt means that the vadose zone and saturated zone materials are largely inert (i.e., do not participate in ion exchange reactions) and may provide little, if any, attenuation of inorganic contaminants (both radioactive and non-radioactive species) that leach from the waste mass.

5.3 Exposure Scenarios

45. Rev. 1a, page 40, line 4- Residential encroachment should not be excluded since institutional controls will likely fail during the time period that the materials remain a radioactive hazard into perpetuity.

46. Rev. 1a, page 40, line 8- Shieldalloy states that farming encroachment to the property boundary is not likely due to anticipated land use factors and need not be considered. However, 10 C.F.R. § 20.1403(e) requires residual radioactivity to be reduced "so that if the institutional controls were no longer in effect, there is reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group is as low as reasonably achievable and would not exceed" under certain specified limits. "Critical group" means the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances." 10 C.F.R. § 20.1003. Based on the current land use, the Department believes that a future resident farmer conducting activities in the vicinity of Shieldalloy's facility is not only an "applicable circumstance", but a likely circumstance. Farms are currently located within a one-mile radius of the Shieldalloy facility. DP Appendix 19.9 Environmental Report § 3.1. In fact, a farm field is currently located less than 500 feet from Shieldalloy's slag pile as see in the attached aerial photograph from www.maps.yahoo.com releases April 2006. (See Attachment 2). Shieldalloy failed to give any reasonable justification as to why the resident farmer scenario should be excluded except to reference a deed notice and unspecified "land use factors". (DP at pages 39-40). Since a deed notice is considered an institutional control, it must be assumed to fail under 10 C.F.R. § 20.1403(e).

47. Rev. 1a, page 40, line 10- The exposure scenario assumes that the property will remain intact. However, elsewhere in the DP it is stated that it is likely that the property will be subdivided (i.e. Rev. 1, page 154, note 102). Because both scenarios are possible, SMC must conduct modeling to determine the dose consequences of leaving the property intact vs. subdividing it.

48. Rev. 1a, page 40, line 12- Stating that all controls will remain in force in perpetuity is unrealistic since the materials will remain a radioactive hazard in perpetuity. This statement in the DP must be revised to be more accurate.

49. Rev. 1a, page 40, line 17- Given the recent rise in the price of uranium to its highest level ever, to state that there is no economic value in the materials is not true. No one can predict the future of the uranium market. DEP believes that there is a possibility that the material may

become so valuable that an intruder scenario with removal of the engineered barrier is quite plausible. This statement in the DP must be revised and appropriate modeling conducted.

50. Rev. 1a, page 40, line 22- The DP states that scavenging the engineered barrier as a source of fill is not likely due to the relative difficulty of scavenging fill from a sloped surface as opposed to a nearby flat surface. The "nearby flat surface" is composed of sand. If rock material were needed as fill or for some other construction project, the engineered cap, as well as the slag beneath it would be an ideal source. Some of the slag material has been crushed so that it could be used as fill. SMC must therefore conduct modeling using this scenario.

51. Rev. 1a, page 41, line1- How can institutional controls be considered a "natural separation" which is not conducive to construction in close proximity to the engineered barrier? What distance does the DP consider to be "close proximity"? These issues require further explanation.

52. Rev. 1a, page 41, line 5- The fence should be assumed to fail since it is reasonable to assume that institutional and engineering controls will eventually fail since the materials will remain a radiological hazard into perpetuity.

53. Rev. 1a, page 41, line 7- This bullet states that natural resource restoration, contaminated soil, county zoning and Pinelands land use restrictions would prevent construction in close proximity to the engineered barrier. SMC uses these assumptions in the dose assessment to limit the evaluation to non-residential exposure scenarios. This approach is erroneous since these three land use restrictions are only institutional controls that are considered to disappear under an "all controls fail" scenario, and do not preclude residential use of the property in the future. Therefore, the dose assessment must include residential exposure scenarios.

54. In addition, SMC misstates some of these land use restrictions as discussed below.

a) Final decisions have not been made with respect to the nature and extent of cleanup of chemical contamination at the facility and whether some or all of the Newfield site will be restricted in use after the remediation of the chemical contamination. A restricted-use cleanup scenario for the contaminated soil was never presented to the public for comment as required under CERCLA, nor was a record of decision signed by DEP and EPA documenting the selection of a restricted-use remediation. Therefore the use of institutional controls for soils was never approved and the remediation of non-radioactive contamination to unrestricted-use criteria was never ruled out. It is important to note that with properly managed engineering and institutional controls of areas with residual chemical contamination, no future use of the facility, including residential, is precluded. It is erroneous for SMC to suggest in the DP that chemical contamination precludes future residential use of the facility. Therefore, the dose assessment must include residential exposure scenarios.

b) The site is not physically located in the Pinelands National Reserve, therefore, any Pinelands land use restrictions are not applicable.

55. Rev. 1a, page 41, line 14- The DP states that there is sufficient justification for excluding the ground water pathway from the dose assessments because the engineered barrier is designed to prevent rainwater infiltration into the consolidated material; the Toxicity Characteristic Leachability Procedure (TCLP) results and distribution coefficients determined for the residual radioactivity in SMC's slag show that there is marked resistance to leaching; the ground water at the SMC site contains chemical contaminants that exceed the National Primary Drinking Water Standards which shows it is not a potable water supply; and it is unreasonable to assume that an onsite drinking water well will be maintained when a source of municipal water is readily available. These justifications are not sufficient to preclude the ground water pathway from the dose assessment for the following reasons discussed below. Therefore, the dose assessment must include the groundwater exposure pathway.

56. Rev. 1a, page 41, line 16- The engineered barrier should be assumed to fail in the dose assessment.

57. The DP is contradictory as to whether the engineered barrier will prevent rainfall infiltration into the consolidated materials. In some sections the DP states that a geomembrane will be present to prevent water infiltration and in others the absence of such a membrane is noted. Also, at the public meeting held in Newfield on December 5, 2006, the NRC staff stated that the engineered barrier will be designed to *allow rainwater infiltration*. Without the geomembrane, the proposed design of engineered barrier allows for the potential leaching of contaminants from the buried materials directly into the ground water. This is of critical importance since no liner is proposed beneath the contaminated materials, and the material sits directly on the native sandy and very permeable soil. In a mere 50 years of operations SMC contaminated the groundwater at the facility with chromium, trichloroethene and other contaminants. The DP proposes disposal of radioactive waste for thousands of years in a manner which would allow further groundwater contamination. The DP must include definitive language about the presence or absence of an impermeable layer in the engineered barrier. Also a permeable cap could allow the leaching of non-radioactive contaminants into the underlying soils and ground water. The DP must provide additional data and justification of using a permeable cap with respect to preventing the potential discharge of non-radioactive contaminants.

58. Rev. 1a, page 41, line 18-

a) Limited TCLP data is used in the DP to support the claim that the slag shows a "marked resistance to leaching." The DP states that slags and baghouse dust were subjected to the TCLP in 2005. The resulting "leachate" was then analyzed for radionuclides only, with the results presented in Appendix 19.4 of the DP. However, there are many limitations to this data as indicated, below.

b) The distribution coefficients determined in Appendix 19.4 for radium in the slag are lower than the RESRAD default, which means that radium is more soluble than RESRAD assumptions, contradicting SMC's statements that the slag shows a marked resistance to leaching.

c) TCLP was only conducted on the slag and baghouse dust. SMC proposes to consolidate radioactively contaminated soils and building materials along with the slag and baghouse dusts under the engineered barrier. However, the contaminated soils and building materials were not analyzed for leachability of radionuclides. Before these materials can be considered for inclusion under the engineered barrier, they must be analyzed for the leachability of radionuclides using an appropriate method. Documentation of the appropriate method must be provided.

d) The TCLP leachate for the slag and baghouse dust was only analyzed for radionuclides. The leachate should have also been analyzed for chemical contaminants pursuant to RCRA to determine if they are hazardous waste and possibly banned from land disposal. Representative samples of any and all of the materials (including contaminated soils and building materials) that will be placed under the engineered barrier must be analyzed for TCLP. Even if the results are below the limits for hazardous waste classification, the TCLP results will indicate if any of the materials are contaminated with metals or other contaminants that may be leachable and present a continuing source of ground water contamination. For example, 1987 EP Toxicity (the predecessor to the TCLP) data of ferrocolumbium slag samples indicate that barium concentrations as high as 23,000 ppb were present in the leachate. The Safe Drinking Water Act Maximum Contaminant Level for barium is 2000 ppb. It is inconceivable that the NRC would ignore the potential of leaving a potential continuing source of contamination, whether hazardous or radioactive.

e) Only three samples of slag (for more than 30,000 cubic meters of a variety of slags) and two samples of baghouse dust (for more than 13,000 cubic meters of dust) were subjected to TCLP and subsequent radionuclide analysis. It is unlikely that these three samples are sufficient to accurately represent the large volume and variety of materials present. A representative number of samples of any and all materials that will be placed under the engineered barrier must be collected and analyzed to determine leachability of both radionuclides and chemical contaminants.

f) The results show that the baghouse dust was analyzed for leachability of radionuclides, but that distribution coeffiecients were not determined.

59. The text of the DP is contradictory on the issue of whether or not radionuclides will leach from the slag (See, e.g., pages 27 and 30).

60. The DP, including the dose assessment, must be revised to address these issues, omissions and contradictions.

61. Rev. 1a, page 41, line 20-

a) The DP states that the groundwater at the facility is already contaminated and not a potable supply but fails to mention that the existing ground water contamination was caused by SMC. SMC has for 27 years operated a treatment system on site to remediate this groundwater contamination. SMC's consultant, TRC Environmental Company, has entered into an oversight document with the NJDEP to remediate the chemical contamination in the ground water, soil, sediment and soil. TRC's goal is to remediate the ground water as quickly as possible, potentially within 20 years. It is therefore incorrect for SMC to state that just because the ground water is already contaminated that it should not be protected against further contamination or should not be considered to be potable source for the next 1000 years in the dose assessments.

b) In addition, in accordance with N.J.A.C. 7:9C–1.5(e), the aquifer beneath the site is classified as Class IIA. The primary designated use for Class II-A ground water shall be potable water and conversion (through conventional water supply treatment, mixing or other similar technique) to potable water. Class II-A secondary designated uses include agricultural water and industrial water. Because the ground water is designated for potable and other uses, it must be included in the exposure scenarios where all controls fail. Even if the ground water is contaminated and treatment is required to make it potable, it still must be included in the exposure scenarios because treatment is an engineering control that should be assumed to fail.

62. Rev. 1a, page 41, line 24- It is unreasonable to assume that a municipal source of drinking water will be available in perpetuity. In addition, the DP fails to mention that the current municipal supply wells are located less than one mile from the site and draw water from the same aquifer that SMC has contaminated. The wells are located upgradient of the site, but the presence of large volume irrigation wells in the immediate area, in conjunction with the constant pumping of the municipal wells, makes transport of the contamination towards and into the potable wells a real possibility over the next 1000 years. In addition, SMC is located in the New Jersey Coastal Plain Sole Source Aquifer and as such there are obvious limits to alternative water supplies. (see http://www.epa.gov/region02/water/aquifer/coast/coastpln.htm#I19). Protection of this resource is critical yet the DP fails to include the ground water exposure pathway in the dose assessments. Therefore, the dose assessment must include the ground water pathway.

5.3.1 Exposure Scenarios for the Unrestricted Portion of the Site

63. The exposure scenarios which assumes an Industrial Worker and an Occasional Trespasser are not the appropriate scenarios for an unrestricted use. SMC must model a resident or a resident farmer since the site will not have restrictions. A resident scenario is very likely since a resident currently lives 100 feet from the facility (Rev 1, Section 1.2). Therefore, Sections 5.3.1.1 and 5.3.1.2 shall to be revised.

5.3.3. Exposure Scenarios Involving the Restricted Portion of the Site (Controls Fail)

64. One exposure scenario that was not modeled is the family that lives near the pile with the slag exposed (failure of the engineered barrier). The Department believes that this scenario is reasonably foreseeable, given the fact that these controls are supposed to last for 1000 years and the slag material will be radioactive for billions of years. Furthermore, a resident currently lives only 100 feet from the facility (Rev.1, Section 1.2). This scenario must be modeled.

5.3.3.1 Recreational Hunter Scenario

65. Inhalation Rate - The default inhalation value of 8,400 cubic meters per year is reduced by RESRAD based on the occupancy factor, so the discussion about the conservatism of the inhalation rate is overstated and must be modified.

66. Cover Erosion Rate- The first sentence states that the cover does not erode and the thickness of the cover does not change. The last sentence states that the erosion rate is calculated in Appendix 19.3. The input into RESRAD is 4.6×10^{-4} meters per year, which results in .46 meters (18 inches) of cover eroding in 1000 years. This inconsistency must be corrected.

5.3.3.2 Suburban Resident Scenario

67. Footnote 156 does not provide sufficient justification for the distance from the pile to a hypothetical resident. The distance from the pile could be much less than 1000 feet, considering the closest resident is currently 100 ft from the site (Rev. 1, Section 1.2). Also, there is no reason why a house could not be built in the reforested area when all controls fail. Since the groundwater is classified as potable, this pathway can not be eliminated. It is unreasonable to assume that municipal water will be available for the foreseeable future. The family could also grow a garden and consume some produce from it. Therefore, all pathways must be used for this scenario, namely direct radiation exposure, particulate inhalation, radon, direct soil ingestion, crop ingestion, and drinking water ingestion.

68. Footnote 157 states that RESRAD supports the position that a suburban resident does not drink groundwater. It must be noted that the same section of the RESRAD Manual also states that in an EPA study (U.S. Environmental Protection Agency, 1994, *Radiation Site Cleanup Regulations: Technical Support Document for the Development of Radionuclide Cleanup Levels for Soil,* review draft, Office of Radiation and Indoor Air, Washington, D.C.) that an on-site well is assumed for drinking in the suburban resident scenario. The DEP assumes a resident has an on-site well, especially in an all controls fail scenario. It is reasonable to assume that municipal water comes from groundwater as it does for most residents in this area of New Jersey, including Newfield.

69. Indoor Time Fraction - The amount of time spent at the site is not conservative. The US Environmental Protection Agency's Exposure Factors Handbook[3] recommends 16.4 hours per day for time indoors. The RESRAD Manual uses 50% of the time spent indoors. There is no recommendation for how many days per year, but the average number of vacation days taken in the US is 13. The standard days per year for a resident is typically 350. The values listed, 240 days for 8 hours per day are not justified. That means the resident is away from home for 4 months out of the year. These values must be justified or modified to reflect accepted published values.

70. Outdoor Time Fraction - The total time at the site contradicts the Indoor Time Fraction (8,760 vs. 1920 hours). In any case, this parameter must be adjusted when the Indoor Time Fraction is corrected.

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[3] Exposure Factors Handbook Volume III, Activity Factors, US Environmental Protection Agency, EAP/600/P-95/002Fc, August, 1997.

71. Inhalation Rate - The statement that the resident is assumed to be on site 100% of the time is confusing and must be clarified. Is it 100% of 1920 hours or 8760 hours?

72. Soil Ingestion Rate - Since it is assumed that a family will live in the house, the soil ingestion rate must be higher to account for children's soil ingestion rate (200 mg/d or 70 g/y)[4].

73. Ingestion of Water - It must be assumed that the resident consumes groundwater. Just because there are no wells inside the Storage Yard does not mean that one cannot be drilled at the edge of the contaminated zone sometime in the future.

74. Distance from the Storage Yard - There is no justification for the distance chosen considering the nearest current resident is 100 feet. The justification shall be provided.

5.3.3.3 Barrier Excavation Scenario

75. Exposure to the Excavator - the excavator would not have to climb a fence because it is assumed that the fence is no longer there, or broken. Again, the geomembrane is mentioned, but in the letter it states that there will be no geomembrane. These statements shall be corrected.

76. Exposure to a Nearby Suburban Resident - Once the small area is excavated and the barrier is breached, erosive forces will more easily degrade the cover. This shall be taken into account and the exposed area should be enlarged for the Suburban Resident and Recreational Hunter scenarios.

77. Pathways Included in the Barrier Excavation Scenario - Inhalation and soil ingestion shall be included in the excavation scenario considering the baghouse dust and contaminated soil will also be exposed.

78. Suburban Resident Exposure Duration - Since it is assumed that a family lives in the house, it is unrealistic to assume they will always be indoors and that no one will investigate the exposed pile. Children shall be assumed to play on the pile. It is not conservative to assume that the resident does not have direct contact with the slag after the engineered barrier is breached. These statements shall be corrected.

5.3.3.4 Industrial Worker Scenario

79. Justification for Key Parameters Used in the Analysis - The DP states that a worker spends 8 hours/day, 5 days/week, and 50 weeks/year at the site which equals 2000 hours/year. It goes on to state that 69% or 1,324 hours of that time will be spent indoors, and 31% or 595 hours will be spent outdoors. These values shall be corrected to1,380 and 620 hours respectively.

80. Ingestion of groundwater by an industrial worker shall be assumed.

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[4] USEPA, 1991. OSWER Directive 9285.603.

81. Using the erosion rate that was used in the RESRAD model for the Industrial Scenario, All Controls Fail, the cover will erode 0.46 meters in 1000 years vs. 0.015 meters as stated in the DP. This statement shall be corrected.

5.4.3.1 Exposure Factors

82. Soil Ingestion Rate – The ingestion rate shall include the contribution from children for the all controls fail and unrestricted use scenarios.

5.4.3.2 Geophysical Parameters for the Engineered Barrier

83. Evapotranspiration Coefficient - Since there will not be vegetation on the cover, the evapotranspiration rate shall be lowered to an appropriate value.

84. Runoff Coefficient - The runoff coefficient of 0.45 appears to be excessively high and requires justification. The mounded topography of the contaminated zone is not expected to increase the runoff to this degree. DEP estimates that a stone and soil cover for the contaminated zone would result in a net recharge of about 11-inches per year and a runoff coefficient approximating 0.26.

85. Cover Soil Density – Again, a geomembrane is mentioned, while the June 30 letter states that there will be no geomembrane in the design of the cap. This discrepancy shall be corrected.

86. Surface Soil Erosion Rate - The erosion rate state in the DP (4.6×10^{-4} **feet**/y) is different than the erosion rate that is used in RESRAD (4.6×10^{-4} **meters**/y). So instead of 6 inches eroded in 1000 years, it is 18 inches. This is significant and even more significant for modeling past 1000 years. This discrepancy shall be corrected.

87. The DP is silent on the issue of tree growth (since there will be no mowing of the cover) and animal burrowing in its evaluation of the integrity of the cap for 1000 years. These issues shall be included in the DP.

88. SMC states that the greatest annual dose occurs past 1000 years. Since the material will still be radioactive, this dose shall be considered. NJDEP modeling shows that the greatest annual dose occurs at 800 years.

5.4.3.3 Geophysical Parameters for Sub-Barrier Zones

89. Contaminated Zone Thickness - SMC shall to explain the sentence "The amount of radioactive material deposited rapidly depletes as the depth increases and terminates at a maximum thickness of approximately 30 feet."

90. Contaminated Zone Hydraulic Conductivity - It is stated that the hydraulic conductivity was measured for the native sand material at the site as 2,000 m/y. However, SMC uses 0.017 m/y for the hydraulic conductivity of the unsaturated zone (which is the native sand layer). This discrepancy shall be corrected.

91. Distribution Coefficient, Contaminated Zone - Table 17.5 lists the K_d of Radium as 50, which is much lower than the RESRAD default, but this is not even mentioned in the text. This seems to contradict the statement that the slag is essentially insoluble even under the most extreme in-situ conditions that might reasonably be encountered. A site-specific K_d was not determined for the baghouse dust or the contaminated soil. These discrepancies and omissions shall be corrected as they will be important parameters when the drinking water pathway is included in the analysis.

92. Hydraulic Conductivity, Undisturbed Surface Layer - The cited reference has no information regarding the hydraulic conductivity of the unsaturated zone. However, there was a table in the report of vertical hydraulic gradient with a value of 0.017 m/y that may have been mistakenly used. This omission shall be corrected.

5.5 Results

93. All scenarios where controls fail shall include the drinking water pathway. The crop ingestion pathway shall be included in any residential scenario where controls fail.

5.5.1 DCGL for Unrestricted Areas

94. The derived concentration guideline levels (DCGLs) are flawed because the scenario and parameters used to derive them are not consistent with unrestricted use. The License Termination Rule (LTR) requires the licensee to demonstrate that the total effective dose equivalent (TEDE) from residual radioactivity is below 25 mrem/y for unrestricted use (10 CFR 20.1402). Since there will be no restrictions on this part of the site, some version of a resident scenario (either a resident farmer or suburban resident) shall be modeled. The stated DCGLs will result in over 25 mrem/y for a residential scenario.

95. The activity ratio of U-238 is listed in the DP as 0.0.47. This error shall be corrected.

96. Further explanation is required as to how the ratios for U-238, U-234, U-235, and Ra-226 were derived and why they were used.

97. The units for the dose factors shall be corrected to mrem/y per pCi/g, from the incorrect pCi/g as described in the text.

5.5.3 Suburban Resident Scenario (Unrestricted Area, Controls Fail)

98. It is stated that the only source of exposure was external radiation stemming from the Storage Yard. This is not the case if the suburban resident is located in the unrestricted area and exposed to the DCGLs derived for an industrial scenario. DEP calculated the dose to be over 25 mrem/y for a residential scenario. DCGLs shall be revised to account for a suburban resident.

5.5.9 Slag Excavation Scenario (Restricted Area, Controls Fail)

99. The Microshield runs neglected to take into account all the progeny associated with uranium and thorium. Because the uranium and thorium in the slag are in equilibrium with their associated decay products, and because most of them are gamma emitters, all of these decay products shall be included in the source term. Using the same geometries as SMC for the shape of the source and the distance from the source, the exposure rates are higher than shown in Appendix 19.5. This omission shall be corrected.

5.5.10 Suburban Resident Scenario (Restricted Area, Controls Fail, Excavation)

100. No attempt was made to take into account exposure from direct contact with the uncovered pile. This is considered to be a realistic scenario given that a family is assumed to live next to the pile. This omission shall be corrected.

101. The justification that prevents the house from being located closer than 1000 feet, considering the nearest current resident is 100 feet away shall be provided. Also the correct external exposure shall to be determined.

5.5.11 Recreational Hunter Scenario (Restricted Area, Controls Fail, Excavation)

102. The external exposure was not assessed properly and shall be corrected.

Section 5 Conclusions

103. Based on the comments above, the following parameters were changed from the SMC dose assessment (see Attachment 3). This assessment results in a peak dose of 1,718 mrem/y at 800 years for the LTC License Alternative even without considering the external gamma dose, which must also be included. This dose level is not protective of human health.

Initial principle radionuclide (pCi/g):	359 for Uranium and Thorium series 16 for Actinium series
Time Since Placement of Material (y)	43
Runoff Coefficient:	0.26
Saturated Zone hydraulic conductivity (m/y)	22,000
Saturated Zone hydraulic gradient	0.002
Unsaturated Zone hydaulic conductivity (m/y)	10,000
Distribution Coefficients for unsaturated and saturated zones	RESRAD default

104. In order to be consistent with the RESRAD runs performed by Shieldalloy, the NJDEP used the only run that included all the drinking water parameters and distribution coefficients, newfield 3004008.RAD, which Shieldalloy termed the Recreational Hunter scenario. Although the drinking water parameters were included in this run, the drinking water pathway was turned off, so the resultant dose from drinking water was not calculated by Shieldalloy. The NJDEP includes only the inhalation, drinking water, and soil ingestion pathways. The scenario is a resident with a drinking water well at the edge of the contaminated zone. The source term used

was the concentration of the slag since mixing of vitreous slag with baghouse dust would not decrease the concentration of the slag.

105. Because of all the reasons stated above, the DP does a very poor job in modeling the TEDE from the materials' residual radioactivity. As such, one cannot determine whether the proposed decommissioning will meet the dose criteria limits in the LTR or will be protective of the public health and safety. In fact, modeling using more reasonable parameters demonstrates that the dose is above 500 mrem/y criteria which exceeds the limits set forth in the LTR. Therefore, the NRC should reject the DP and require that the slag be disposed of in an offsite licensed low level radioactive waste facility.

<u>Section 7 ALARA Analysis</u>

106. The report states that the three alternatives are described in Chapter 6 of the DP, yet Chapter 6 simply refers to Appendix 19.9. SMC should state that the three alternatives are described in Appendix 19.9.

107. It is difficult to determine how to do an ALARA ("as low as reasonably achievable") analysis for the LTC alternative, since reducing the residual radioacitivity below the dose levels is not being performed.

108. NUREG 1757 Vol.2 Appendix N states that the ALARA analysis should provide an unbiased analysis of the remediation action, which can both avert future dose (a benefit to society) and cost money (a potential detriment). Since a benefit was never calculated in this chapter, a true ALARA analysis was not performed. An accurate ALARA analysis is needed in order to determine if restricted use is even allowed pursuant to 10 CFR 20.1403(a). The collective averted dose is the dose to the future population who drinks contaminated water and receives doses from exposed slag beneath a breached engineered barrier, not the dose incurred by workers who remove the pile, or a comparative dose between remedial options. According to NUREG 1757 vol. 2 page N-4, "the collective averted dose should be based on the same exposure scenarios used for the compliance calculations", not the dose incurred from performing the remedial action. In addition, since the material will remain radioactive in perpetuity, the length of time for modeling shall be increased past 1000 years.

7.1.1 On-Site Stabilization and Long Term Control (LTC) Alternative

109. The on-site stabilization and LTC Alternative is not a decommissioning option as described in the heading of section 7.1, rather it is a license amendment. This shall be corrected.

7.2.1 Radiological

110. The whole discussion of radiation risks is misleading. The author discusses chronic exposures and acute exposures without explaining the difference and the different health effects. This may confuse the lay reader and does not present a fair assessment of the health effects of radiation. The author attributes the statement that no effect has ever been observed at levels below 5,000 mrem delivered over a one year period to the Health Physics Society. The Health

Physics position paper actually states that the risks of health effects below 5–10 rem (which includes occupational and environmental exposures), are either too small to be observed or are nonexistent. The paper goes on to state that "the possibility that health effects might occur at small doses should not be entirely discounted. The Health Physics Society also recognizes the practical advantages of the linear, no-threshold hypothesis to the practice of radiation protection. Nonetheless, risk assessment at low doses should focus on establishing a range of health outcomes in the dose range of interest and acknowledge the possibility of zero health effects."

111. Furthermore, the Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation recently released the Biological Effects of Ionizing Radiation (BEIR) VII report. The BEIR VII committee concluded that current scientific evidence is consistent with the hypothesis that there is a linear dose-response relationship between exposure to ionizing radiation and the development of radiation-induced solid cancers in humans. This conclusion is based on many facts (contrary to the statement made in the DP that this conclusion is not supported with facts). For example, the Committee stated that there is compelling support for the linearity view of how cancers form. Studies in radiation biology show that "a single radiation track (resulting in the lowest exposure possible) traversing the nucleus of an appropriate target cell has a low but finite probability of damaging the cell's DNA. Subsets of this damage, such as ionization "spurs" that can cause multiple damage in a short length of DNA, may be difficult for the cell to repair or may be repaired incorrectly. The Committee has concluded that there is no compelling evidence to indicate a dose threshold below which the risk of tumor induction is zero."[5] The explanation of radiation risks in the DP would lead one to believe that the radioactive material at SMC is harmless. The current scientific evidence does not support this view. The DP shall be revised to more accurately state the potential radiation risks of radiation in general and the materials at the site.

112. The risk coefficient that is used in the DP is not consistent with Table 4-2 of the BEIR V report. The derivation of the risk coefficient shall be described so that it can be verified whether or not it was determined correctly. Also it is not stated whether the $5x10^{-4}$ risk coefficient is an annual or lifetime risk. Using Table 4-2 for lifetime risks per 100,000 exposed persons, it cannot be determined how this coefficient in the DP was derived. It is uncertain how the risk from high Linear Energy Transfer (LET) radiation was taken into account in this risk coefficient since it is stated that radiation could be taken into the body through inhalation and ingestion. The omitted information shall be provided. In addition, if the risk coefficient used in the DP is not accurate, all the risk calculations in this section shall be reworked.

7.2.1.1 On-site Workers

LTC Alternative

113. Are the adjusted Annual Limit on Intakes (ALI) and Derived Air Concentrations (DAC) applied to the assumed air concentrations of uranium and thorium still applicable considering the site is not operational? Since the workers will be working in close proximity to the slag, it

[5] Health Risks from Exposure to Low Levels of Ionizing Radiation, BEIR VII Phase 2, National Research Council, National Academies Press, Washington, D.C., 2006.

is not unreasonable to assume that their dose rate potential will be higher than the average measured exposure rate. This information shall be provided.

LT Alternative

114. Footnote 173 is misplaced; the slag will not be covered in the LT Alternative. This error shall be corrected.

115. The dose from airborne radionuclides is overestimated since the disposal facility stated that crushing is not necessary on site. Dose and risk values shall be adjusted accordingly.

7.2.1.2 Members of the Public

LC Alternative

116. How is the radon dose rate of 8.2×10^{-3} uR/h determined? This information shall be provided.

117. Assuming the risk coefficient is correct, the lifetime risk from 70 years of exposure would be 2.5×10^{-2}. Since conservatism is used for this scenario (assuming that a member of the public is present somewhere around the storage yard constantly and continuously), then it shall also be used for the all controls fail LTC scenario so that there is a fair comparison. The LTC Alternative will be biased as the safest alternative when the doses from the LC and LT alternatives are conservative, but the doses from the LTC scenario are not.

LTC Alternative

118. The dose incurred from the all controls fail scenario shall be added to the dose from the shaping of the slag pile and installation of the engineered barrier. The dose should be comparable to the LC Alternative in order to present a fair comparison.

LT Alternative

119. Footnote 180 is misplaced since the material will not be covered in this scenario. This error shall be corrected.

120. Since crushing will not be done in Newfield, the concentration of respirable airborne particulates shall be corrected.

7.2.2 Transportation

121. The transportation accident fatality rate is listed as 6.6×10^{-7} per kilometer. It not clear as to whether this is for truck or train transportation. The total accident incident rate with fatalities from the Federal Railroad Administration, Office of Safety Analysis may not be the most appropriate statistic since it includes commuter rail lines. What rail carrier was used to generate this coefficient? Is this from all rail carriers in the US? Is that appropriate? Additional information shall be provided to answer these questions and justify the use of the stated fatality rate.

LTC Alternative

122. Since Section 8.3 of the DP states that the neither the source for the rock layer nor the soil source for the barrier has been identified, this analysis cannot be completed. The information shall be provided to complete the analysis.

123. 7,220 miles equals 11,620 kilometers, not 12,033 kilometers. This error shall be corrected.

LT Alternative

124. It is unclear which accident fatality risk coefficient is used for train travel. Based on the website cited, it should be 7.82×10^{-8} rather than 2.3×10^{-7}. The units for the calculation should be rail car kilometers, not kilometers. The conversion from miles to kilometers is wrong. If the accident fatality risk coefficient listed is used, the resultant fatalities are greater than 1. Further justification and explanation shall be provided for the risk calculations. Correct units shall be used and the calculations clearly stated.

7.3.1 Remedial Action Activities

125. Revision 1a of Tables 17.14 through 17.16 have different cost figures than stated in the corresponding sections of the text of Rev.1. These discrepancies shall be corrected.

126. The text shall be updated with the new figures.

LC Alternative

127. The cost for remedial action for the License Continuation alternative should be $0 since no remediation is taking place.

LT Alternative

128. According to NUREG-1757, page N-7, survey costs related to evaluating compliance at the dose limit are not part of the ALARA analysis. It is not clear whether SMC is doing an ALARA analysis or just a cost comparison between the alternatives. If it is an ALARA analysis, then the cost for the final status survey should be subtracted. Clarification of the cost shall be provided.

129. EnergySolutions has repeatedly quoted a price of $33 million dollars for a turnkey operation for the removal and off-site disposal of the radioactive materials (see Attachment 4). Adding the 25% contingency brings it to $41,250,000 rather than $62,864,543 listed in Table 17.15, Rev. 1a. This discrepancy shall be corrected.

7.2.3 Transportation of Waste

LT Alternative

130. The cost of transporting the waste was included in the figure for Remedial Action Activities. It is being counted twice. This error shall be corrected.

7.2.4 Waste Disposal

LT Alternative

131. The cost of disposing the waste was included in the figure for Remedial Action Activities. It is being counted twice. This error shall be corrected.

7.2.3 Cost of Construction (non-Radiological) Risks

132. Footnotes 192-194 reference NUREG 1757 Section N.4 which uses a cost of $20,000 per person-rem. However, this value addresses circumstances in which a licensee would be required to demonstrate that further reductions in residual radioactivity would be prohibitively expensive as per 10 CFR 20.1403(e)(2). Since the DP never mentions that this section of the LTR applies to their situation, it is unclear as to why they are using this figure.

7.2.4 Cost of Transporation Risks

LT Alternative

133. The cost shall be revised based on the correct transportation fatality risk coefficient, as discussed above.

7.3.6 Cost of Radiological Risks (with Long-Term Surveillance and Maintenance)

134. According to NUREG-1757, long-term surveillance and maintenance should not be included in the analysis. The costs shall be revised to address this issue.

LC Alternative

135. The cost shall be zero since there is no remediation taking place.

LTC Alternative

136. Cost estimates are not accurate since the dose from the all controls fail scenario is not included. This omission shall be corrected.

LT Alternative

137. There was an error in calculating the person-rem, and therefore the cost. Assuming a population density of 109 persons and a dose of 1,802 mrem, the collective dose would be 196 person-rem, not 344 person-rem. The cost is then closer to $13,053,532 rather than $22,901,000. This error shall be corrected.

7.3.7 Licensing Costs

138. NUREG-1757 states that Regulatory Costs avoided should not be included as costs related to restricted release. The Regulatory Costs shall be removed from the Licensing Costs.

7.3.8 Change in Land Value

LC Alternative

139. NUREG-1757 states that other costs should include the loss of economic use of the property while the remediation is taking place. For the LC Alternative that cost should be zero since no remediation is taking place. This error shall be corrected.

LTC Alternative

140. The loss of economic use of the property shall be calculated for 1000 years and beyond. To state that the value of the land will increase is absurd. It can only be assumed that if the land were unrestricted, there would be greater economic use of the property. The DP shall be revised to address these issues.

LT Alternative

141. The loss of economic use of the property shall be calculated for two years (the time that they will be implementing the DP).

7.3.9 Environmental Impacts

142. According to NUREG-1757, Environmental impacts refer to ecological damage to the environment as a result of the remedial action, not long-term environmental impacts as described in the DP.

LC Alternative

143. Long-term leaching of Ra-226 into the groundwater shall be accounted for.

LTC Alternative

144. Long-term leaching of Ra-226 into the groundwater shall be accounted for.

LT Alternative

145. According to EnergySolutions, the material will not be crushed on site prior to off-site disposal, so it may be possible to eliminate the costs of controlling the emissions associated with the crushing operations.

146. Is it proper to include indirect environmental costs associated with the disposal site in Utah?

7.4 Cost/Benefit Analysis

147. The equation used by SMC to calculate the cost of a given level of protection (X), could not be located in NUREG-1757. This information shall be provided.

148. The use of $20,000 per person-rem averted (α), is not being used correctly since the person-rem listed for each alternative is not the dose averted, but the dose incurred. This error shall be corrected.

149. Since there has not been a benefit calculated, the requirements of 10 CFR 20.1403(a) have not been fulfilled. This omission shall be corrected.

7.5 Summary

150. As stated above, an ALARA analysis was not completed. Also, since no benefit was calculated, it is unknown if the LTC practice should be adopted. Most importantly, because of

the inconsistencies throughout this chapter, it cannot be stated that the LTC is the most defensible decommissioning option for this site based upon ALARA considerations. SMC shall revise the DP to address all of the above discrepancies, omissions and corrections for the three alternatives evaluated before it can make any statements as to decommissioning option is the most defensible.

Section 8 Planned Decommissioning Activities

151. Rev. 1, Page 93, line 2 - The LTC option should not be referred to as "decommissioning," but rather as a "license amendment."

152. Rev. 1, Page 93, line 6 - The final status survey of the remainder of the site shall be performed before consolidation of the waste material so that additional waste can be identified.

8.1 Contaminated Structures

153. SMC does not identify the release limits for those portions of the concrete pads that will be disposed of as industrial waste. This information shall be provided.

8.3.1 Engineered Barrier Construction

154. It shall be stated how monitoring will be performed and what action levels will be used to trigger more extensive dust control measures.

8.3.2 Adjacent Soil Characterization

155. SMC shall include the area outside of SMC's fence lines, including the fence lines to the north and south, in its additional soil characterization.

156. SMC states that it "may place other inert (unlicensed) soils beneath the engineered barrier to prepare the engineered barrier subgrade, to shape the site surrounding the engineered barrier or to isolate other soil materials regulated by NJDEP" [emphasis added]. It is unclear what SMC means by "other soil materials regulated by NJDEP." If SMC is referring to the soils contaminated with metals and other non-radioactive contaminants known to exist at the site, then the DP shall be revised to omit this statement because SMC does not have approval from NJDEP or USEPA nor is there a signed CERCLA record of decision for disposal of the contaminated soil in this manner. If SMC is referring to radiologically contaminated soils below NRC licensable source material concentrations then the DP shall be revised to omit this statement as well since the DEP regulations would not allow such a disposition.

157. SMC shall also clarify what is meant by "inert (unlicensed) soils." These soils may be contaminated at levels that are below NRC limits, but still above the NJDEP Soil Remediation Standards for Radioactive Materials (N.J.A.C. 7:28-12) or above the NJDEP Soil Cleanup Criteria and may require remedial action pursuant to NJDEP or USEPA regulations.

8.3.3 Engineered Barrier Completion

158. The potential for radiation exposures from all exposure pathways over the next 1,000 years, even if no barrier maintenance takes place, is greater than 500 mrem/y if the drinking water pathway and external gamma exposure are taken into account. The DP shall be revised include the drinking water pathway and external gamma exposure.

159. The external gamma exposure of the daughter products of uranium and thorium were not accounted for correctly in the Microshield model. This error shall be corrected.

8.3.4 Final Status Survey

160. Since SMC is not sure how much or where slag was used on other portions of the site, (Section 4.5), the whole site shall be classified as "impacted." According to MARSSIM impacted is defined as areas with the possibility of containing residual radioactivity in excess of natural background or fallout levels.

8.4 Surface and Groundwater

161. There is data in the Environmental Report (Appendix 19.9, Appendix B) that show results of water samples. It is unclear if they are surface water samples or groundwater samples, since this is not indicated. In either case, the results are above the NJ Surface Water standards at N.J.A.C. 7:9B1.14(c) (the Hudson Branch is classifed as FW2-NT) and above the NJ Groundwater Quality Standards at N.J.A.C. 7:9C. Since this data did not come with the associated laboratory results sheets, it is difficult to determine how it was analyzed and whether or not the data is valid. There is no uncertainty or minimum detectable concentration listed. This information shall be provided.

162. In Appendix 19.2 there is groundwater data presented. Table 1 lists the filtered radiological data that is over the USEPA groundwater screening levels or whose minimum detectable activity (MDA) is over the USEPA's required MDA. The USEPA requires a MDA of 3.0 pCi/L for gross alpha analysis and 4.0 pCi/L for gross beta analysis.

Table 1

Well	Sample date	Gross Alpha (pCi/L)	Gross Beta (pCi/L)
W3S	12/17/88	<5.0	<6.0
W2	8/1/89	<4.0	
SC11S	4/26/89	**5.5 +/ 1.3**	**75 +/ 1.9**
	8/1/89	<5.0	<8.0
SC12S	10/26/88	**5.6 +/ 3.1**	**59 +/ 6**
	4/25/89		**71 +/ 8**
	8/1/89	<9.0	
	9/28/89	<9.0	**69 +/ 1.5**
SC13S	4/25/89	**10+/ 2 [7.2 +/ 1.8]**	
	8/1/89	<10.0	<20.0
A	8/1/89	<4.0	<5.0
	9/28/89		<5.0

Bold values are above USEPA screening levels. "Less than" values are above the required MDA.

As required by the USEPA (including the standards that were current at the time of sampling), when the gross alpha result is above 5 pCi/L, then radium-226 must be analyzed. Although Ra-226 was analyzed as required, Ra-228 was not analyzed, so it is unknown if the maximum contaminant level of 5 pCi/L Ra-226+Ra-228 was exceeded. In the regulations at that time, in 40 C.F.R. § 141.26(a)(1)(i), it recommends that States require radium-228 analyses when the gross alpha particle activity exceeds 2 pCi/L in localities where radium-228 may be present in drinking water. Therefore, since there is a source of Ra-228 (slag pile), in order to determine if the MCL for total radium was exceeded, Shieldalloy should have followed this protocol and analyzed for Ra-228 as well as Ra-226. Radium-228 is a beta emitter and may be a contributor to the elevated gross beta. At the time that the samples were taken, if the gross beta was above 50 pCi/L, then additional analysis to identify the contributing nuclides was required. The USEPA now requires that if gross beta is above 50 pCi/L, then potassium should be measured and subtracted. If the gross beta result is still greater than 50 pCi/L, then additional testing must be performed to determine the specific nuclides that are contributing to the elevated reading. In any case, the statement made in the DP that no radiological impacts above USEPA screening levels exist in downgradient groundwater is not true. These statements shall be revised to accurately summarize the analytical results and the limitations of this old data.

163. Since it is unknown if there are radiological exceedences of the groundwater standards in the downgradient groundwater, the planned license amendment shall take into account continual monitoring of the groundwater, which shall be incorporated into the cost estimate. The RESRAD model shows that radium will leach into the groundwater starting at about 450 years, using the SMC parameters, with a hypothetical drinking water well at the edge of the contaminated zone.

Section 9 Project Management and Organization

9.4.3 Radiation Worker Training

164. The DP shall include a discussion of chronic effects of exposure to radiation or naturally occurring radiation sources, both of which directly apply to this site.

Section 10 Health and Safety Training

10.1.1 Workplace Air Sampling Program

165. The DP states that Th-230 has the most limiting Derived Air Concentration (DAC), however, according to Table 1, Column 3 of Appendix B of 10 CFR 20, Actinium-227, Thorium-232, and Protoactinium-231 all have more limiting DACs and are all present in the contaminated material (Table 17.7 of the DP). This statement shall be corrected.

166. The DP states that some air sampling will be performed to achieve a baseline value as soon as operations begin and routinely thereafter. Baseline readings are normally taken before operations begin so the effect of the operation can be distinguished from background. This

would allow the 4-5 days for decaying the radon and thoron daughters without concerns about exceedences since the operations would not have started. Once background is established, the delayed count would not be necessary during operations since it could be subtracted. The DP shall be revised to address this issue.

10.1.6 Contamination Control Program

167. Table 17.10, Acceptable Surface Contamination Levels, appeared to be based on Table 1 of the Regulatory Guide 1.86, but is missing the row (see below). Should this row, which is one-tenth the limit of thorium, be used to determine compliance since it includes Radium-226, Radium-228, Thorium-230, Thorium-228, Protoactinium-231, and Actinium-227 , all of which are present in the slag?

Radionuclide	Contamination Level ($dpm/100cm^2$)		
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	Average	Maximum	Removable
	100	300	20

Section 11 Environmental Monitoring and Control Program

11.1 Environmental ALARA Evaluation

168. Footnote 77 shall specify that it is Table 2, Column 1 in Appendix B of 10 CFR 20 which the air sampling results will be compared to.

169. Section 10.1.1 shall specify how individual nuclide concentrations will be determined.

11.2 Effluent Monitoring Program

170. The DP states that the action levels in Section 10 will be used for effluent monitoring. However, the action level identified in Section 10, 10% of the DAC, would exceed the allowed effluent concentration for air (Table 2, Column 1 of Appendix B of 10CFR 20). This discrepancy shall be revised.

Section 12 Radioactive Waste Management Program

12.1 Solid Radioactive Waste

171. All of the materials, especially the soils and building materials, that will be placed in the proposed unlined landfill with a permeable engineered barrier shall be analyzed to demonstrate that that are not hazardous wastes or will not act as continuing sources of radiological or non-radiological (chemical) contamination.

12.3 Mixed (Radioactive and Hazardous) Wastes

172. It is stated that "the ongoing soil remediation plan under the jurisdiction of the USEPA has no potential for generating mixed wastes as a results of this remediation. In Section 8.3.2, SMC states that it may "isolate other soil materials regulated by NJDEP" under the engineered barrier. SMC does not provide data or justification that the materials being addressed in this DP are not hazardous wastes that are banned from land disposal pursuant to RCRA. All of the materials, especially the soils and building materials, that will be placed in the proposed unlined landfill with a permeable engineered barrier shall be analyzed to demonstrate that that are not hazardous wastes or will not act as continuing sources of radiological or non-radiological (chemical) contamination.

Section 13 Quality Assurance Program

13.2.1 Procedures

173. The Quality Implementing Procedures shall be reviewed by the NRC and the NJDEP before use.

13.2.2 Laboratory Services

174. Off-site laboratory sample analysis shall be performed by a laboratory certified by the NJDEP's Office of Quality Assurance.

Section 14 Facility Radiation Surveys

14.1 Characterization Surveys

175. The DP discusses SMC's 1991 characterization survey. NJDEP had numerous concerns regarding the characterization. Please refer to Attachment 1 for comments applicable to the following sections of the DP: Measurement Descriptions (Section 14.1.1), Field Instruments, Methods and Detection Sensitivities (Section 14.1.2), Laboratory Instruments, Methods and Detection Sensitivities (14.1.3), Survey Results(Section 14.1.4), and Adequacy of Characterization Survey. Also, as stated earlier, there is no valid data presented in the 1992 IT report, which Shieldalloy relies on for its characterization.

14.1.5 Maps and Drawings Showing Non-Impacted/Impacted Areas

176. Appendix 19.6 contains tables of analytical results only, not site drawings. According to MARSSIM, a non-impacted area is an area "where there is no reasonable possibility (extremely low probability) of residual contamination." Non-impacted areas are typically located off-site and may be used as background reference areas." There are no non-impacted areas on the SMC site since it is unknown where slag was used as fill. The figures shall be provided for review.

14.2.1 Materials and Equipment Release Criteria During Decommissioning

177. This section refers to a Table 1, however there is no Table 1 in the DP. Table 17.10 lists the acceptable surface contamination levels, but leaves out the levels for Radium-226, which is also

present in the slag, and has release levels that are more restrictive than the levels for natural thorium. Table 1 shall be provided.

178. SMC should be made aware that some landfills and metal recycling facilities have radiation detectors which are set to reject material at 10% above background. So even if the material meets the release limits, it should be checked to make sure the gamma levels are indistinguishable from background.

179. If material exhibits surface contamination levels above background, the DP states that it will be disposed of as low level radioactive waste (LLRW). The DP shall specify whether these materials will be sent to a licensed LLRW disposal facility or buried with the LLRW in the storage yard.

14.3.1 Final Status Survey Design Overview

180. The DP incorrectly states that SMC's current license (No. SMB-743) will be terminated. NRC has stated that SMC's current license will be amended into a LTC license. This statement shall be corrected.

14.3.2 Derived Concentration Guideline Levels (DCGLs)

181. Further explanation shall be provided for the statement "Although Class 1 survey units are present at the Newfield site, in order to interject an element of conservatism into the decommissioning effort, only wide-area DCGLs, using the values shown in Table 17.11 are applicable."

14.3.4 Classification of Areas

182. In the first paragraph it is implied that there will be non-impacted areas, but Figure 18.11 and the last paragraph of this section state that all areas that are not Class 1 or Class 2 will be Class 3. The map does not delineate the Class 3 areas. Are they all other areas out to the property line?

183. The Hudson Branch should be a Class 1 area since there is contamination above the DCGLs in the sediment. The area north of the storage yard (outside the property boundary) should be a classified survey unit since there is documentation of thorium contamination in that area (Map 7 Appendix B of Appendix 19.9).

184. The Note on Figure 18.11 refers the reader to Appendix P of the 1991 site characterization report to find the areas where slag was used as fill and that these areas will be Class 1 areas. It is unclear if these Class 1 areas are marked on the map or not. This shall be clarified.

185. Since the DP states that it is not known where slag was used as fill (Section 4.5), the areas designated as Class 3 on the map should be Class 2 for suspected contamination.

14.3.10 Analytical Instrument Description

186. The analytical laboratory must be certified by the NJDEP's Office of Quality Assurance. Consult the NJDEP website for approved laboratories. http://www.nj.gov/dep/oqa/

14.3.11.1 Surface Soil Survey Methods

187. It shall be stated how the fill slag mentioned in Section 4.5 of the plan will be detected. Different scan MDCs will need to be developed to account for shielding of the buried slag.

14.3.11.2 Sample Analysis

188. This section states that there may be on-site gamma spectroscopy performed which contradicts section 14.3.9 which states that "no in-situ measurements of radionuclide concentration in soils or other solid material will be made. Instead, samples will be collected and forwarded to a commercial analytical laboratory for analysis." This discrepancy shall be resolved.

14.3.14.2 Area Factors

189. There is not enough information presented to determine if the area factors were derived correctly. Additional information supporting the derivation of the area factors shall be provided.

190. This section neglected to mention that Section 8.5.2 in MARSSIM must be followed, that is a determination of the average residual radioactivity in the survey unit. This omission shall be corrected.

Section 15 Financial Assurance

15.1 Cost Estimate

191. The cost estimate for the LTC Alternative does not include the cost of groundwater monitoring, underestimates the cost of cap maintenance and does not account for inflation. The DP fails to ensure that sufficient funds are available during the entire period that the radiological hazard continues in order to conduct required survey, maintenance , license and inspection, and trust expenses. The DP assumes a real rate of return of 1% from the financial assurance for each year over 1,000 years. However, the DP fails to consider inflation when estimating the annual costs involved to maintain the cap or to provide for an annual contractor's profit. Furthermore, it is inappropriate to assume an annual rate of return after 300 years. See Hearing Request Contention No. 8; Neill, H. And Neill, R. Perspectives on Radioactive Waste Disposal: A Consideration of Economic Efficiency and Intergenerational Equity pages 6, 8 (WM'03 Conference, February 23-27, 2003).

Chapter 16 Restricted Use and Alternate Criteria

16.1 Overview

192. The DP incorrectly states that SMC's current license (No. SMB-743) will be terminated. NRC has stated that SMC's current license will be amended into a LTC license. This statement shall be corrected.

16.2 Eligibility Demonstration

193. The problems with the costs of the alternatives were described in NJDEP's comments to Section 7. The DP states that it is clear that implementation of the LTC Alternative results in radiation dose potential that is ALARA, however, NJDEP determined that the calculations are flawed. Therefore, it is not clear that the eligibility requirement in 10 CFR 20.1403 was actually met.

194. SMC is correct in its statement that the State has not responded to SMC's request for New Jersey's position on State Ownership, Control, or Oversight. Before the State could answer, it requested written responses to its comments on NUREG-1757, and financial disclosure from SMC. To date, the NJDEP has not received the financial disclosure from SMC.

16.3 Institutional Controls and Engineered Barriers

195. Footnote 102 states that members of the public "strongly support" the future sale of all or a portion of the unrestricted portion of the property. The word "strongly" is an overstatement of the public support for this. The public simply preferred the option of selling all or a portion of the unrestricted portion of the property rather that letting the entire property sit idle since they do not believe that any one would be willing to take over the entire property and the an NRC license. There was not overwhelming support as SMC is suggesting. The footnote shall be modified.

16.3.1 Description of Legally-Enforceable and Durable Institutional Controls

196. The State objects to the provisions in NUREG-1757 that allow SMC to pursue a Long Term Control License. See Petition to the Third Circuit Court of Appeals, Request to the NRC for Rulemaking, and Request to the NRC for a Hearing.

16.4 Site Maintenance and Financial Assurance

197. The plan states that the presence of a geomembrane will limit the depth of impact that burrowing animals could have on the integrity of the barrier. The geomembrane was removed from the design, but the impact of burrowing animals on the integrity of the barrier is not accounted. This impact but shall be accounted for.

16.5.4 Evaluation of SSAB Advice

198. SMC failed to meaningfully incorporate the advise of the Site Specific Advisory Board in the development of the DP because the LTC Alternative was still evaluated as selected by SMC as its preferred option. See Hearing Request Contention No. 14.

199. Rev. 1, page 166, line 12 and Rev. page 171, line 21– The response to the comment that there should be a liner mentions the leachability tests that were done and states that no discernable leaching occurred at all. This is not true, as shown in Attachment B to Appendix 19.4. The distribution coefficients for radium show that radium is capable of being leached. The modeling results confirm this. High pH water is usually not used for TCLP testing. This response does not address the public's concern.

The SSAB was told about the recent leachability tests that were performed which they claimed demonstrated that the slag would not leach. The data was never provided until after the last SSAB meeting when the DP was submitted in October, 2005. Likewise, the dose modeling was not provided until after the last SSAB meeting when it was submitted in Rev. 1. This modeling was proven to be inadequate since the NRC rejected Rev. 1 of the DP. The SSAB never had an ALARA analysis until after the last SSAB meeting. SMC relied on the ALARA analysis done at the Cambridge, Ohio facility and cost estimates for disposal of $102-$112 million (DP Rev.0)., There was no information regarding the hydraulic performance of the cover. At the time of the last SSAB meeting, a geomembrane was part of the engineered barrier design. While Shieldalloy now states that the geomembrane will not be utilized, the DP nevertheless relied on the geomembrane in developing its runoff coefficient. Had this information been provided to the SSAB, the SSAB could have provided better advice on whether the proposed institutional controls would assure that an average member of the public would not incur a radiation dose in excess of 25 millirem Total Effective Dose Equivalent ("TEDE"); whether the $5 million financial assurance would be adequate to enable an independent third party to assume responsibility for control and maintenance of the site; and whether the proposed engineering design of the barrier was adequate.

Shieldalloy states that it adequately addressed public opposition in the DP. The SSAB advised that onsite disposal would be an undue burden on the community, but this was not incorporated into the DP. In fact, in their ALARA analysis, Shieldalloy actually contradicts the SSAB's advise by stating that aesthetic improvements associated with the engineered barrier could result in an increase in future land use value. The SSAB advised that institutional and engineering controls would not last for the duration of the radiological hazard, but this was not incorporated into the DP. The SSAB questioned how Shieldalloy would keep radioactivity from entering the groundwater and Shieldalloy responded that a geomembrane would be an integral part of the engineered barrier design, yet the geomembrane was later omitted from the DP. The NJDEP believes that the DP should state, under section 16.5.4, that the SSAB was unanimously opposed to the LTC license option. Because of the strong and universal public opposition to onsite disposal, the DP should have proposed offsite disposal of the radioactive waste to an appropriate disposal facility.

16.6 Dose Modeling and ALARA Demonstration

200. The dose modeling used parameters that are not conservative enough and excluded the drinking water pathway without sufficient justification. The ALARA analysis was not done properly. These issues shall be addressed.

Section 17 Tables

17.2 Background Soil Concentrations

201. There is no uncertainty provided with the analytical results. "A reported value without an accompanying uncertainty statement is for nearly all purposes worthless."[6] The uncertainty information shall be provided. If unavailable, then the data shall not be included in the DP.

Table 17.3 RESRAD Input Parameters

202. There should be a Table for Common Parameters (similar to Table 17.3.1) for the Restricted Area, Controls in Place. This would be less confusing than justifying restricted use parameters in Table 17.3.1 which is entitled Common Parameters (Unrestricted Area, Controls in Place).

203. The printouts in Appendix 19.5 do not include all the scenarios. The missing information shall be provided.

204. Runoff Coefficient: The runoff coefficient of 0.45 appears to be excessively high without justification. The mounded topography of the contaminated zone is not expected to increase the runoff to this degree. NJDEP estimates that a stone and soil cover for the contaminated zone would result in a net recharge of about 11-inches per year and a runoff coefficient approximating 0.26.

205. Hydraulic Conductivity of the Unsaturated Surface Layer: The hydraulic conductivity of the Unsaturated Surface Layer is incorrectly given as 0.017 meters per year (m/yr). This number is orders of magnitude too low for a sand and gravel sediment. Table 17.3 in Appendix B states that this value represents measured hydraulic conductivity in the sandy soils present at the site and references the April 1992 Remedial Investigation Technical Report. The 1992 Report presents no data on measured hydraulic conductivities of this layer. It appears possible that TRC incorrectly selected the vertical hydraulic gradient value measured at monitor well cluster SC13S and SC13D in Table 22 of the 1992 Report as a measured hydraulic conductivity.

206. The unsaturated surface layer consists of gravel and sand of the Bridgeton Formation. The expected hydraulic conductivity of this material is in the range of 100-200 feet per day which equates to 11,000 to 22,000 m/yr.

207. Hydraulic Gradient of the Saturated Zone: The hydraulic gradient of the saturated zone is listed as an estimate in Appendix A and B as 0.004. Reference is given to the April 1992 Remedial Investigation Technical Report. However, measurement of the hydraulic gradient of the saturated zone in the 1992 Report show the gradient at the site to be 0.002, one half the gradient used in RESRAD. The Ground Water Modeling Memo also uses the 0.002 hydraulic gradient value. Therefore, the hydraulic gradient of the saturated zone used in RESRAD is not correct and shall be changed to 0.002.

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[6] Colle, R. Abee, H.H., et al,"Reporting of Environmental Radiation Measurements Data", in Upgrading Environmental Radiation Data, EPA 520/1-80-012, US Environmental Protection Agency, Washington D.C.

208. Distribution Coefficient for Radium: Appendix A and B list a distribution coefficient (Kd) for Radium of 53 cm^3/g. The justification provided is the leaching tests on the waste slag materials. This value may be justified for calculations in the slag, but not for bag house dust materials, and not for use in the unsaturated surface layer or in the saturated layer.

The unsaturated zone sediments of the Bridgeton Formation and the saturated sediments of the Cohansey Formation are both low in cation exchange capacity and clay content. The pH levels are also low. An analysis of the pH data, from the 1992 Report, for ground water at the site indicates that about 50% of the monitor wells have water with a pH of less than 6.0 and 68% have a pH of less than 7.0. Radium adsorption is minimal at acidic pH values (< 7) and adsorption increases with increasing pH. Therefore, adsorption of radium is likely to be quite low in these zones. The same technical basis partially explains why radium is a naturally occurring contaminant in well water of the Cohansey Aquifer in southern New Jersey – the aquifer has minimal capacity to adsorb it.

Therefore, to adequately model the potential transport of radium from the waste into ground water and to down gradient receptors, adsorption/desorption tests should be conducted on the bag house dust, and sediments from both the unsaturated zone Bridgeton Formation and the saturated zone Cohansey Formation.

Table 17.4 RESRAD Exposure Pathways

209. The justification for excluding the radon pathway does not make sense. The fact that the source term has a very long half-life does not preclude radon from being a contributor to dose. Radon shall be included in the assessment, especially of the unrestricted area.

Table 17.5 Partition Coefficients

210. The listed values for the partition coefficients were determined site specifically on the slag. The baghouse dust and contaminated soil partition coefficients (K_d) were not determined. In addition, the K_d determined for the slag cannot be used for the unsaturated and saturated zone K_ds.

Table 17.7 Source Term

211. Since the slag is vitreous in nature, it cannot be blended with the soil and baghouse dust. Therefore, the concentration of the slag shall be input into the model, not the "derived" concentration. Using the concentration of the slag in the model results in a dose of over 500 mrem/y, if the drinking water pathway is included.

Table 17.8 Dose Modeling Results

212. None of the results are justifiable based on NJDEP's comments on Section 5. Table 17.8 shall be revised

Table 17.9 Comparison of Risks and Costs

213. Since the dose was not determined correctly, the costs and risks are not accurate. Table 17.9 shall be revised.

Table 17.10 Acceptable Surface Contamination Levels

214. Row for radium is missing and is the most limiting. Table 17.10 shall be revised.

Table 17.13 Area Factors for Outdoor Radiation Surveys

215. Not enough information was provided to determine if the Area Factors were determined accurately. Table 17.13 shall be revised.

Table 17.14 Cost Estimate for the LTC (Long Term Control) Alternative

216. The cost estimate for the LTC Alternative does not take into account leaching of the radionuclides into the groundwater. Table 17.14 shall be revised.

Table 17.15 Cost Estimate for the LT (License Termination) Alternative

217. EnergySolutions estimate is different than that one that is describe here.

Appendix 19.4 Distribution Coefficient

218. The letter from Carol Berger to Dave Smith states that TCLP tests were run on the baghouse dust, yet there is no Kd listed in Attachment B for baghouse dust. This discrepancy shall be resolved.

Appendix 19.6 Radionuclide Concentrations in Soil

219. Although the title of the Appendix indicates this is soil data, the table contains soil, sediment and water data. It is unknown if the water is ground water or surface water since it is not clearly stated. There are no uncertainties included with the results. These discrepancies shall be resolved.

Appendix 19.9 Environmental Report

220. It is assumed that the NRC Environmental Impact Statement will replace this Appendix, so the text of the Environmental Report was not reviewed.

Appendix B

221. The water sample at H49 on Map 6 is above the surface water standard for total uranium[7], 52 ug/L compared to the NJ Surface water standard of 30 ug/L. Several samples of water on Map 8 are above the surface water standard for radium. Several sediment samples are above

[7] U-238 concentration (pCi/L) is divided by 0.3365 pCi/ug to determine total uranium mass concentration.

the NJDEP soil cleanup standards for radium. Clearly, the Hudson Branch is contaminated above background concentrations and needs to be addressed in the DP.

Appendix C Ground Water Potability

222. Ground Water Potability: The Ground Water Potability Report fails to mention that the goal of the NJDEP required pump and treat systems are to decontaminate and restore the aquifer to potable conditions. Eventually, the Classification Exception Area should be removed. The Ground Water Potability Report should include a timeline showing when levels of chromium, volatile organics, and other contaminants will meet drinking water standards. Since the Decommissioning Plan is dealing with radioactive materials that will remain a hazard for thousands of years, it is clear that the ground water cleanup and aquifer restoration should be complete in the relatively near future. The assertion in the Ground Water Potability Report, that ground water at and near the site is not potable must be put in context of the timeline for ground-water cleanup. The drinking water pathway must be taken into consideration over the long term.

Appendix D Ground Water Modeling Memo

223. Insufficient Data Submitted: The ground water modeling memo is only a summary of the work conducted. There is not enough information supplied to complete an adequate evaluation of the modeling results. The MODFLOW input and output files, as well as the results of the sensitivity analysis are needed for evaluation. However, there is enough information to make some obvious criticisms.

224. Hudson Branch: The surface water of Hudson Branch flows through the model domain. It is expected that the Hudson Branch is in direct connection with shallow ground water. It should probably be included in the model as a drain feature.

225. Distribution Coefficients: As described above in the RESRAD comments, the adsorption/desorption tests conducted on the waste slag materials are not directly transferable to the aquifer materials. Therefore, adsorption/desorption tests should be conducted on the site sediments from the saturated zone Cohansey Formation, so that the transport of the radionuclides can be modeled with some level of confidence.

226. The DP states that RESRAD assumes that a well is installed directly on top of the engineered barrier, with groundwater drawn from immediately below the location of the licensed radioactivity. This is not the case. When the Non-dispersion option is selected in RESRAD, the well is assumed to be installed at the edge of the contaminated zone. The RESRAD run referenced (Newfield: 300308.rad) is not included so it is not known if this option was selected. Since in the all controls fail scenario, there is nothing to prevent the installation of such a well, this MODFLOW groundwater transport supplement is not needed.

Appendix F Letter from Carol Berger to Dave Smith dated June 9, 2005

227. Attachments 1 and 2 are not included. The laboratory data reporting sheets should be included also. The gross beta results are not included so it cannot be determined if the 50 pCi/L screening value is exceeded. Again, the uncertainties are not reported.

228. The interpretation of Table 2 is not correct. There is an EPA MCL for total uranium which is 30 ug/L. Total Uranium can be determined by dividing the U-238 concentration in pCi/L by 0.3365 pCi/ug. The referenced EPA regulation 40 CFR141.66(d)(2) is very specific in that the dose must be calculated using the National Bureau of Standards Handbook 69 as amended August 1963, US Department of Commerce, not the EPA's Federal Guidance Report No. 11. Therefore, the MCLs calculated in Table 3 are wrong. In addition, as stated above, there is an EPA MCL for total uranium.

229. The Borough of Newfield wells have been tested by the Bureau of Safe Drinking Water and have generally been below 2 pCi/L for Ra-228 for the past several years. Therefore, the statement that the radionuclides in the wells at SMC are indistinguishable from background cannot be made.

If you have any questions, please contact me at (609) 633-1494.

Sincerely,

Donna L Gaffigan

Donna L. Gaffigan, Case Manager
Bureau of Case Management

Attachments 1) December 1, 1992 NJDEP Memo
2) Aerial photograph from www.maps.yahoo.com released April 2006
3) Summary report from RESRAD 6.22
4) October 9. 2006 EnergySolutions Letter

C: David R. Smith, SMC
Clerk, Newfield Borough

References

USEPA, 2004, Understanding Variation in Partition Coefficient, Kd, Values, Volume III: Review of Geochemistry and Available Kd Values for Americium, Arsenic, Curium, Iodine, Neptunium, Radium, and Technetium, EPA 402-R-04-002C.

ATTACHMENT 1

State of New Jersey
Department of Environmental Protection and Energy
Division of Environmental Safety, Health and Analytical Programs
CN 415
Trenton, NJ 08625-0415

Scott A. Weiner
Commissioner

Gerald P. Nicholls, Ph.D.
Director

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DEC 3 1992

December 1, 1992

M E M O R A N D U M

To: Donna Gaffigan, Case Manager
Bureau of Federal/State Case Management

Through: Robert Stern, Ph.D., Chief
Bureau of Environmental Radiation Bob S.

From: Nancy Stanley, NS Radiation Physicist 2
Bureau of Environmental Radiation

Subject: Comments on the "Assessment of Environmental Radiological Conditions at the Newfield Facility"

The Bureau of Environmental Radiation (BER) has completed a review of the Assessment of Environmental Radiological Conditions at the Newfield Facility of the Shieldalloy Metallurgical Corporation (SMC) dated April 9, 1992, performed by ENSR Consulting and Engineering and prepared by IT Corporation/Nuclear Sciences. Comments are provided below in both a page-specific and generalized format.

SECTION 3.0, METHODOLOGY

1. Page 3-2, third paragraph

No soil samples were collected east of the slag piles or to the west of the plant. Sampling in the vicinity of areas known to be contaminated is not sufficient to fully determine the extent of contamination. A complete characterization of this site cannot be performed unless the entire site is sampled in a more representative manner. Additionally, it must be explained why there were 30 soil samples taken in a pre-determined background area when the purpose of this characterization was to identify possible contaminated areas. Background has already been established via separate sampling (Appendix F).

2. <u>Page 3-3, second paragraph</u>

The screening levels for gross alpha and gross beta, respectively, are 5 pCi/L and 15 pCi/L (40 CFR 141), not 15 and 50 as stated (these are maximum contaminant levels; MCL's).

3. <u>Page 3-5, last paragraph</u>

A more comprehensive discussion of the specific methodologies employed by the subcontractor is needed.

SECTION 5.0, SUMMARY

4. <u>Page 5-1, second paragraph</u>

10 CFR 20 states that for an unrestricted area, no individual may receive a dose in excess of 100 millirem in any seven consecutive days. No indication is made in this passage as to how the particular figures presented were determined. They are not presented as a dose, but as an exposure rate. SMC cannot be considered in compliance with this regulation until it can be shown that this condition has been met.

5. <u>Page 5-1, third paragraph</u>

It is indicated that the elevated walkover survey results are caused by shine due to the presence of the slag piles as opposed to any soil contamination. This cannot be substantiated without any soil sampling in the area.

6. <u>Page 5-2, first and second paragraphs</u>

No mention is made of the numerous high levels of radium-226 in both the water and soil/sediment samples in the Hudson Branch. A majority of the results for the soil/sediment samples exceed the 5 pCi/g limit set by 40 CFR 192. Additionally, no distinction is made as to which isotope of radium the 33.1 pCi/L value is for. No discussion of background values for surface waters is presented in this document, yet it is stated that the values obtained during this study do not differ significantly from them. Also, the values of 15 pCi/L alpha and 50 pCi/L beta activity are maximum contaminant levels, not background levels, and do not take into account any contribution from uranium. Additionally, no mention is made of any of the water samples which exceeded both of these limits (grid location 0+60L, for example, from Appendix K).

APPENDICES

7. Appendix B

It would be helpful to show the equation obtained for the regression here.

8. Appendix E

This map indicates the sporadic nature of the soil sampling. These locations are not sufficient to truly characterize this site. No samples are taken in areas shown previously to be contaminated (ORAU 1988). For example, there is no sampling near South Haul Road, where gamma exposure rates are elevated (Appendices G and H). Without soil sampling in this area, it cannot be determined what is causing the elevated readings. The investigation of South Haul Road is mentioned as an objective of this study.

9. Appendix G

There are no data for areas along the northern fenceline which has been shown to be contaminated (ORAU 1988).

10. Appendix H

Map 1 eliminates the use of the 30 uR/hr contour line "for clarity". This eliminates all of the higher readings creating the impression that there is no exposure rate above this. Map 3, Haul Road exposure rates, shows readings all above established background rates. There is no discussion of this in the text of the report. Map 4 of the Hudson's Branch indicates a single anomalous reading. No explanation or discussion of this measurement is given in the text.

11. Appendix J

Elevated fenceline gamma exposure rates are indicated along the northern fenceline. This is a further indication that more soil sampling must be performed in this area.

12. Appendix K

There are several issues relating to the presentation of the data in this Appendix as well as the data itself which must be addressed.

a. The data for soil, sediment and water samples would be best presented separately, for clarity, as opposed to being presented only by grid location.

b. It is stated in the text of the report that all water samples were to have been analyzed for both suspended and dissolved alpha and beta. This data does not appear to be included. If it is here, it is not indicated as such.

c. As stated above, it is not indicated which water data, suspended, dissolved or otherwise, is presented. This must be added.

d. No distinction is made between a QC and duplicate sample. An explanation of each type of sample must be given.

e. There are no reported uncertainties associated with this data. At a minimum, the error associated with the counting of the sample must be reported with an indication as to the level of confidence.

f. What little QC data exists is insufficient. There are no reported blank or spike samples for any of the analyses. If these were performed, the results must be supplied.

g. For the soil and sediment samples, presumably analyzed by gamma spectroscopy, there was no consistency as to the nuclides reported. All soil and sediment samples were to be analyzed for the same nuclides. These gaps in the data must be filled or explained.

h. There is no indication or description of which methods were utilized for these analyses. This is also true for the remainder of the report. It is not sufficient to refer the reader to previous reports for this information.

i. Where there are duplicate measurements made, the analyses reported are not the same for the two samples. In the case of grid location EE47, the duplicate measurement does not include U-238, Th-232 or Ra-226.

j. Explanations must be provided in instances where there is missing data (grid location DD41 soil, as an example).

k. The sample at grid location A33 is designated a water while the QC sample at the same location is designated a soil. An explanation for this is needed.

l. Settling pond data is given in this appendix but there is no discussion of the results.

m. Sample collection and analysis dates must be provided for all samples.

n. There is no indication of whether the soil and sediment samples were sealed for 21 days prior to analysis in order to reach secular equilibrium. This must be noted.

13. Appendix N

It is evident from looking at this presentation of the data that Hudson's Branch is contaminated with radium-226 (values above 5 pCi/g as per 40 CFR 192). A discussion of these results must be made and the problem addressed.

GENERAL COMMENTS

Overall, the organization of this presentation was poor. There are many questions which remain unanswered concerning contamination at this site. The data was offered in such a way as to present an incomplete picture of the site. The overall objective of this study, as per the workplan, was to determine the location and extent of contamination. This was barely addressed in the text of the report.

There are numerous problems with the actual data as it is presented here. These items are discussed under the page-specific comments made previously, but in general the overall presentation of the results is inadequate. It appears as though very little QC was performed, leading to the question of whether the data is actually valid. Additionally, there is very little discussion of the results and how they relate to the established objectives of the characterization.

If the objective was indeed to characterize this site and determine potential areas of contamination, the way in which sampling was performed did not begin to address this. Some areas which had previously been determined to be contaminated (the 1988 ORAU study), such as portions along the northern fenceline, were not even sampled. Other regions not adequately sampled, if at all, include the western and eastern fencelines. It is impossible to assess the extent of contamination without investigating all possible effected areas in and around the site. A reliable characterization must include much more rigorous sampling and analysis. The area in the vicinity of South Haul Road as well as those fenceline areas listed above must be sampled before this investigation can be considered complete.

An additional task stated at the beginning of this report was to determine the fenceline exposure rate. This was reported as a maximum of 0.13 milliR/hour (22 milliR in seven days). The report goes on to state that SMC is therefore not in excess of the limits set forth in 10 CFR 20. An exposure rate is being compared to a dose rate, which is not appropriate. As specifically outlined in 10 CFR 20, the radiation level not to be exceeded for an individual in an unrestricted area is 100 millirem over seven consecutive days. This limit is in millirem, which is a unit of dose, while the values presented in the report are in units of exposure, microR. It must be shown through calculation of absorbed dose (accounting for all radiations present) that they are in compliance.

Supplemental to this discussion, it should be noted that numerous references are made to the Quality Assurance Plan for this project (listed under the section of the report entitled "References"). The DEPE has yet to receive a copy of this document and as such cannot determine whether or not this plan was followed or if it was sufficient to address the objectives of this study.

Additionally, in April of 1991, comments to the final ENSR workplan (dated March 1991) for this assessment were submitted by the BER. To date, none of the recommendations set forth in this memo (attached) have been implemented. In brief, the majority of the recommendations made by the BER in the April memo dealt with the characterization of the slag and lime piles stored on site, investigation of the ferrovanadium slag and addition of several nuclides to the list of isotopic analyses performed. Without implementation of these recommendations to constitute a more thorough plan, it cannot be agreed that this characterization is complete.

c. Fred Sickels, BER

ATTACHMENT 2


250 m
0.2 miles
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ATTACHMENT 3

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary
File: FGR 13 Morbidity

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.720E+00	6.720E+00	DCF2(1)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(2)
B-1	Pb-210+D	2.320E-02	2.320E-02	DCF2(3)
B-1	Ra-226+D	8.600E-03	8.600E-03	DCF2(4)
B-1	Ra-228+D	5.080E-03	5.080E-03	DCF2(5)
B-1	Th-228+D	3.450E-01	3.450E-01	DCF2(6)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(7)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(8)
B-1	U-234	1.320E-01	1.320E-01	DCF2(9)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(10)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(11)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(2)
D-1	Pb-210+D	7.270E-03	7.270E-03	DCF3(3)
D-1	Ra-226+D	1.330E-03	1.330E-03	DCF3(4)
D-1	Ra-228+D	1.440E-03	1.440E-03	DCF3(5)
D-1	Th-228+D	8.080E-04	8.080E-04	DCF3(6)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(7)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(8)
D-1	U-234	2.830E-04	2.830E-04	DCF3(9)
D-1	U-235+D	2.670E-04	2.670E-04	DCF3(10)
D-1	U-238+D	2.690E-04	2.690E-04	DCF3(11)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(5,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 Morbidity

Menu	Parameter	Current Value	Default	Parameter Name
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(8,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(10,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(10,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(10,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(11,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(11,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(11,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(5,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(5,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(6,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(7,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7,2)
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(8,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(8,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(9,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(10,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(10,2)
D-5				

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: FGR 13 Morbidity

Menu	Parameter	Current Value	Default	Parameter Name
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(11,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(11,2)

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.823E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.800E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.350E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.000E+02	2.500E+01	---	BRDL
R011	Time since placement of material (yr)	4.300E+01	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	1.000E+01	3.000E+00	---	T(3)
R011	Times for calculations (yr)	3.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	1.000E+02	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+03	1.000E+02	---	T(6)
R011	Times for calculations (yr)	1.000E+04	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+05	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ac-227	1.600E+01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Pa-231	3.590E+02	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Pb-210	3.590E+02	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ra-226	3.590E+02	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Ra-228	3.590E+02	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Th-228	3.590E+02	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Th-230	3.590E+02	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): Th-232	3.590E+02	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): U-234	3.590E+02	0.000E+00	---	S1(9)
R012	Initial principal radionuclide (pCi/g): U-235	1.600E+01	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): U-238	3.590E+02	0.000E+00	---	S1(11)
R012	Concentration in groundwater (pCi/L): Ac-227	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Pa-231	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Th-228	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): Th-232	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(9)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(11)
R013	Cover depth (m)	1.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.900E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	0.000E+00	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	2.800E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	4.650E-05	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	2.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	2.880E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.250E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	6.250E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.050E+00	1.000E+00	---	PRECIP

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Irrigation (m/yr)	0.000E+00	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.600E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.520E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.200E+04	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	2.880E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	2.500E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.650E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+04	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ac-227				
R016	Contaminated zone (cm**3/g)	2.400E+03	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.549E-05	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Pa-231				
R016	Contaminated zone (cm**3/g)	2.700E+03	5.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.376E-05	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.714E-04	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	5.300E+01	7.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.003E-04	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	5.300E+01	7.000E+01	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.003E-04	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Th-228				
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.146E-07	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.146E-07	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for Th-232				
R016	Contaminated zone (cm**3/g)	5.201E+04	6.000E+04	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.146E-07	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.283E-07	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---	DCNUCC(10)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(10,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.283E-07	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	7.036E+04	5.000E+01	---	DCNUCC(11)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(11,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.283E-07	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	3.000E-05	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	not used	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	not used	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.800E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
C14	DCF correction factor for gaseous forms of C14	not used	8.894E+01	---	CO2F
STOR	Storage times of contaminated foodstuffs (days):				

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	1	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	suppressed
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Contaminated Zone Dimensions	
Area:	18230.00 square meters
Thickness:	2.80 meters
Cover Depth:	1.00 meters

Initial Soil Concentrations, pCi/g	
Ac-227	1.600E+01
Pa-231	3.590E+02
Pb-210	3.590E+02
Ra-226	3.590E+02
Ra-228	3.590E+02
Th-228	3.590E+02
Th-230	3.590E+02
Th-232	3.590E+02
U-234	3.590E+02
U-235	1.600E+01
U-238	3.590E+02

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 1.000E+02 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	1.000E+01	3.000E+01	1.000E+02	1.000E+03	1.000E+04	1.000E+05
TDOSE(t):	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.554E+03	4.637E+02	1.698E+01
M(t):	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.554E+01	4.637E+00	1.698E-01

Maximum TDOSE(t): 1.718E+03 mrem/yr at t = 801 ± 2 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 8.011E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pa-231	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

ATTACHMENT 4

ENERGY*SOLUTIONS*

October 9, 2006

Mr. David Smith, Environmental Manager
Shieldalloy Metallurgical Corporation
14 West Boulevard
P.O. Box 768
Newfield, New Jersey 08344-0768

Re: Proposal for Site Cleanup and Off-Site Disposal

Dear Mr. Smith:

Energy*Solutions* has reviewed Shieldalloy Metallurgical Corporation's Decommissioning Plan (Revision 1a, dated June 30, 2006). Additionally, based on the inquiries of public agencies and the media, we wanted to renew our offer for the cleanup, transportation and offsite disposal services for Shieldalloy's radioactive slag, ash and soil material through **turnkey cleanup.**

Based on Sheildalloy's Decommissioning Plan, there are 81,000 tons of radioactive material requiring disposal. A total project cost can be calculated from Energy*Solutions*' proposal as follows:

Startup including refurbishing existing railway, installing additional Railway and adjacent loading scales, and other startup, mobilization activities..$ 2,600,000

Material cleanup and disposal:
81,000 tons @ $37,600 per railcar (ie. 810 railcars @ $37,600 ea.)....$30,456,000
included: project management, excavation, loading, transportation offsite disposal and an environmental protection barrier

Total cost...$33,056,000

These are fixed costs for a turnkey, all-inclusive site cleanup with off-site disposal of material. If the actual volumes differ, the cost would be more or less, based on the actual amounts loaded. Energy*Solutions* remains willing to take responsibility for the site cleanup and would agree to offer Shieldalloy a financial plan to spread payments over several fiscal years based on an adequate financial guarantee.

Our proposal for offsite disposal would be prudent compared to cost underestimates in Shieldalloy's Decommissioning Plan for license continuation or long-term control for costs such as construction, monitoring and security. In the plan, these alternatives also lack provision for adequate financial surety for items such as remediation of contaminated groundwater, repairs from intruder damage, etc.

423 West 300 South, Suite 200 • Salt Lake City, Utah 84101
801.649.2000 • Fax: 801.321.0453 • www.energysolutions.com

EXHIBIT A

ENERGYSOLUTIONS

Page Two
Mr. David Smith
October 9, 2006

Similar to our October 2005 letter and in light of inflated numbers being cited in publications to the public and the interest shown by residents and officials, this letter may be provided to interested parties requesting a clear understanding of cost.

Energy*Solutions* is anxious to assist Shieldalloy in completing this project. Should you have additional questions, please do not hesitate to contact me.

Very truly yours,

Al Rafati
President, Business Development

FGC/mab
Enclosure

cc: Eric Jackson, Shieldalloy Metallurgical Corporation