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December 8, 2005

Mr. David Nelson
Program Manager
Materials Decommissioning Section
Decommissioning Directorate
Division of Waste Management and Environmental Protection
U.S. Nuclear Regulatory Commission
Mail Stop: T-7F2
Washington, DC 20555-0001

**Subject: Response to Second Request for Additional Information
SCA Hartley & Hartley Landfill Site, Kawkawlin Township, Michigan
NRC Source Material License No. SUC-1565**

Dear Mr. Nelson:

On behalf of S.C. Holdings, Inc., RMT, Inc., is providing the attached responses to the USNRC's October 28, 2005, letter requesting additional information with regard to the Decommissioning Plan for the SCA Hartley & Hartley Landfill Site (RMT, November 2003). The October 28 letter contained the USNRC's second Request for Additional Information (RAI). The first RAI was dated October 14, 2004, to which S.C. Holdings responded in a letter dated May 9, 2005.

S.C. Holdings developed the attached responses after telephone conversations with Shamica Walker on November 10, 2005, and with you, Ms. Walker, and Mark Thaggard on November 16, 2005. The Decommissioning Plan will be revised to incorporate the additional information provided in response to both RAIs. Please call Phill Mazor, at (616) 688-5777, extension 17, if you have any questions concerning the information contained in the attachment to this letter. We look forward to timely approval of the Decommissioning Plan.

Sincerely,

RMT, Inc.

Linda Hicken

Linda E. Hicken, P.E.
Senior Project Manager

Attachments

cc: Jim Forney, Waste Management, Inc.
Phillip Mazor, Waste Management, Inc.
Rachel Schneider, Quarles & Brady
Bill Thomas, Integrated Environmental Management, Inc.
Carol Berger, Integrated Environmental Management, Inc.

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Attachment 1

Responses to the USNRC's October 28, 2005 Request for Additional Information with Regard to the Decommissioning Plan for the SCA Hartley & Hartley Landfill Site Kawkawlin Township, Michigan

Request #1: ***You provided a minimum, maximum, and average dose value for the analysis of the Northwest Landfill. It is unclear why the average dose is not used for demonstration compliance as opposed to the minimum dose, as stated in Section 5.5. Please explain your rationale for using the minimum dose.***

Response: The radiation doses assessed using the RESRAD computer model were based upon probabilistic as well as deterministic methods. The probabilistic analysis yielded a minimum exposure value of 2 millirem per year (mrem/yr) after 1,000 years, and a maximum exposure value of 14 mrem/yr after 1,000 years. The uncertainty associated with the probabilistic analysis gives a peak of the mean radiation exposure of 5 ± 2 mrem/yr, after 1,000 years. On the other hand, the deterministic result, which is a nonstatistical analysis, gives a single value of 1.4 mrem/yr after 1,000 years when the site-specific input parameters are used as input to the code. To accommodate the USNRC's request, the text in Subsection 5.5.1 and Table 5-6 of the Decommissioning Plan have been revised to reflect the peak of the mean probabilistic result of 5 mrem/yr (see Attachment 1A).

Request #2: ***When deriving the derived concentration guideline limits for the slag piles, cumulative effects should be considered, such as, the additional dose received from the Northwest Landfill. Please explain the rationale for not considering the additional dose or account for this dose in developing residual concentration levels.***

Response: The slag piles are located some distance from the Northwest Landfill. Because radiation dose decreases as the receptor's distance from the source increases, the radiation dose from the materials within the capped landfill at the location of the remediated slag piles will be only a fraction of the dose a receptor would receive when standing directly on the capped landfill.

For example, the dose potential for a hypothetical industrial worker standing for 2,000 hours per year directly on top of the capped Northwest Landfill, as shown in Subsection 5.5.1 of the Decommissioning Plan, is less than 5 millirem TEDE over 1,000 years. If that same hypothetical worker moves to, and remains at, a location that is 10 feet away from the capped landfill for 2,000 hours per year, his dose potential will drop by a factor of at least 100 to a maximum of 0.05 millirem TEDE. If he moves to, and remains at, a spot that is 30 feet from the capped landfill, his dose potential would drop further to a maximum of 0.006 millirem TEDE. Because the remediated slag piles are located more than 30 feet from the perimeter of the Northwest Landfill, the dose contribution from the capped landfill at those locations will be trivial at best, and certainly not distinguishable from background. Therefore, it is not necessary to take into account the presence of the capped Northwest Landfill in the derivation of the DCGLs for the remediated slag pile land areas. The DCGLs described in Table 5-5, with the significant figures shown, correctly reflect the potential exposure from the remediated slag piles.

Request #3: ***There are two different concentration values for Pb-210 provided for the Northwest Landfill (Table 5-4). Please explain the different values.***

Response: Table 5-4 contains a typographical error. The last row in this table should be for Uranium-238, not Lead-210. The concentration of Uranium-238 that was used in the RESRAD code was 2.54 pCi/gram, and the concentration of Lead-210 used was 0.61 pCi/gram. Therefore, the calculations performed using RESRAD were correct, as were the conclusions drawn from these results. Table 5-4 has been corrected accordingly (see Attachment 1A).

Request #4: ***Page 5-5 lists the exposure pathways for the industrial worker as inhalation, direct exposure to gamma radiation, and soil ingestion. Clarification is needed as to why the meat ingestion and aquatic food pathways were suppressed in the dose analysis for the Northwest Landfill. Note that these pathways were suppressed for the analysis of the slag piles.***

Response: As stated in Subsection 5.2.2 (page 5-2), the reasonably foreseeable land use is industrial, wherein the potential receptor is an industrial worker who may work at the site for a portion of the year. Subsection 5.2.2 (pages 5-2 through 5-5) explains this approach in detail, including the physical features of the site that prevent its future development. The potential exposure pathways for an industrial worker are external radiation, inhalation of dust, and soil ingestion. No other pathways for exposure to the industrial worker exist. As stated in Subsection 5.2.2, *"The critical group is an industrial worker who works 8 hours per day on the site and does not ingest meat and milk from livestock raised on the site, as specified in the manual for RESRAD (Yu et al., 2001)."* This approach was used to design the cover, as well as in the derivation of DCGLs for the slag piles that will be excavated during remedial activities. The meat ingestion and aquatic foods pathways were suppressed for both of these assessments.

Request #5: A dose analysis of the leachate collection system and the storage tank should be provided. In your DP, you indicated that a leachate extraction system will be installed in the Northwest Landfill and that the system would be used for an indeterminate period of time after the site had been released for unrestricted use. In your response to the RAI, you addressed the potential for exposure to

radioactive contamination if the leachate system leaked during operation, the potential for exposure to contamination in the leachate piping during operation of the system, and the potential exposure of the workers to contaminated leachate in the storage tank. However, a dose analysis of exposure to the leachate collection system and the storage tank was not provided. Since you have requested that the site be released for unrestricted use, issues such as these regarding the operation of the system need to be addressed.

Response: S.C. Holdings concurs with the approach used by the Michigan Department of Natural Resources (MDNR) (and approved by the USNRC) to evaluate the potential radiological exposure from the leachate in the on-site storage tank[1]. Using the same approach, and incorporating radiological data for the leachate in the Northwest Landfill, as well as the projected potential levels of radioactivity in this leachate calculated using RESRAD, S.C. Holdings believes that future workers at the SCA Hartley & Hartley Landfill site will not be exposed to appreciable amounts of radioactive contamination stemming from operations involving leachate handling.

The USNRC's comment suggests that the unique properties of gamma radiation present an additional exposure pathway that does not require direct human contact with the leachate. The USNRC hypothesizes that the penetrating gamma radiation pathway (external pathway) could result in exposures to workers or visitors even if no leakage or direct contact with the leachate occurs. In response to the USNRC's concern, S.C. Holdings has formulated and evaluated an exposure scenario to address this potential exposure pathway. The exposure scenario involves an industrial worker who hypothetically stands 1 meter from the leachate storage tank for an entire work-year. In this scenario, the limited sections of the leachate transfer piping that extend above grade were not included because the vast majority of the leachate transfer piping is, and/or will be, buried below grade, and because it is more conservative to assume that a worker spends all work hours standing next to the larger source.

In addition, it was assumed that the 15,000-gallon leachate storage tank that was installed at the site this past summer to collect leachate from the East Landfill is used to collect leachate from the Northwest Landfill and the MDNR Landfill, as well. To be conservative, it was assumed that all of the leachate in the storage tank was extracted from only the Northwest and/or MDNR Landfills. (This is a simplifying conservative assumption because the thorium-bearing slag that was disposed in the Northwest and East Landfills was not known to have been disposed in the East Landfill. Ultimately, the contents of the storage tank will be a mixture of the leachate from each of the three landfills; however, the relative contribution from each landfill is difficult to predict and will likely vary over time.)

[1] Letter from the MDNR to the USNRC, dated December 20, 2004.

The modeled scenario was made even more conservative by assuming that the tank is always completely full (an impracticable, but simplifying and conservative, assumption), and that the concentration of residual radioactivity in the leachate is the maximum concentration projected over the 1,000-year outlook by RESRAD using the "system leakage" scenario. The "system leakage" scenario is also conservative, in that it assumes the presence of thorium radioactivity in slag at the specific activity limit.

The MicroShield computer modeling code (Version 5.01) (Grove Engineering, 1996) was used to assess the radiological exposure conditions resulting from a gamma radiation source. The MDNR used MicroShield in their analysis of the same exposure scenario. Under the above highly conservative exposure scenario, MicroShield projected a maximum potential gamma radiation exposure on the order of 10^{-3} mrem/hr for a worker who hypothetically stands at a distance of 1 meter from the tank for an entire work-year. This converts to an annual gamma radiation dose of less than 2 mrem/yr (based on approximately 2,000 work hours per year). The results of this analysis are attached (see Attachment 1B) for the USNRC's review and consideration.

Attachment 1A

Revisions to the Decommissioning Plan

roots exist in the lower portion of the root zone because of the inability of the root system to extract enough moisture from the lower levels.

5.4.9 Transfer Factors to Plants

The plant/soil concentration ratios for root uptake are given by the vegetable/soil transfer factors. In the RESRAD code, the plant/soil transfer factor is expressed as the ratio: picocuries per gram (pCi/g) plant (wet)/pCi/g soil (dry) for each chemical element (Yu et al., 1993). The uncertainty distribution for these elements is assumed to be truncated lognormal-n, where the value is assigned as a default parameter of the RESRAD code. Table 5-3 lists the distribution parameter that was used for each chemical element. The default selected by the USNRC was determined to be appropriate for each element, including thorium, uranium, radium and lead.

The plant/soil transfer factor is defined as the ratio of radionuclide concentration in vegetation to that of the soil. The plant/soil transfer factor of a radionuclide varies in a complex manner with soil properties and the geochemical properties of the radionuclide in the soil. The transfer factor for a given plant type can vary from site to site and season to season. In addition, management practices such as plowing, liming, fertilizing, and irrigating greatly affect the plant/soil transfer ratio (IAEA, 1994). Sparse data exist for most radionuclides, and the data that do exist are restricted to only limited vegetation types (NCRPM, 1999). The values of the plant/soil transfer factors can vary over several orders of magnitude.

5.5 Results

The radiation analysis was performed using RESRAD 6.2 and the parameter distributions described in Subsection 5.4 of this report. The results are discussed below, and are summarized in Table 5-6.

5.5.1 Northwest Landfill

The Northwest Landfill will only contain those isotopes that are currently present and will be covered with an improved cover. In spite of the inherent conservatism built into this analysis, it is clear that the maximally-exposed annual radiation dose from all pathways is less than ~~2~~5 millirem per year, after 1,000 years (the peak of the mean probabalistic analysis). As important, the groundwater is not ingested by the industrial worker; it is assumed that the worker ingests water from a municipal water source. The output of the RESRAD code is provided in Appendix D.

~~The radiation exposure was calculated to be less than 2 millirem per year, after 1,000 years. This radiation exposure was based on the presence of the radionuclides in the Northwest Landfill, as described in Table 5-4. The principal element of the exposure was found to be the result of direct radiation exposure after the cover erodes; this pathway for exposure contributed approximately 35 percent to the total dose.~~ The analysis of the uncertainty indicated an average radiation exposure of 5 ± 2 millirem per year. This radiation exposure was based on the presence of the radionuclides in the Northwest Landfill, as described in Table 5-4. The principal element of the exposure was found to be the result of direct radiation exposure after the cover erodes; this pathway for exposure contributed approximately 35 percent to the total dose. The minimum exposure was calculated to be 2 millirem per year after 1,000 years. The maximum exposure was calculated to be 14 millirem. In this analysis, the groundwater pathway was suppressed along with the plant pathway.

5.5.2 Surface Soil Outside the Northwest Landfill

The DCGLs provided in Table 5-5 reflect the concentration of radionuclides that may be present outside of the Northwest Landfill and result in a maximum exposure of less than 25 millirem per year over background. The presence of these isotopes will be verified after the remediation is completed and the final status survey is implemented. Information regarding the final status survey is provided in Section 14 of this Decommissioning Plan. The output of the RESRAD code is provided in Appendix D.

The radiation exposure resulting from the DCGLs was calculated to be 25 millirem per year, observed after 1 year. The principal element of the exposure was found to be the result of direct radiation exposure from the surface of the soil; this pathway for exposure contributed approximately 85 percent to the total dose. The analysis of the uncertainty indicated an average radiation exposure of 23 ± 2 millirem per year. The minimum exposure was calculated to be 10 millirem per year after 1 year. The maximum exposure was calculated to be 25 millirem per year over background.

Table 5-4
Derived Concentration Guideline Levels for the Northwest Landfill
SCA Hartley & Hartley Landfill Site
Kawkawlin Township, Michigan

ISOTOPE	CONCENTRATION PRESENT IN THE NORTHWEST LANDFILL (pCi/g)
Lead-210	0.61
Radium-226	0.61
Radium-228	18.67
Thorium-228	17.96
Thorium-230	2.54
Thorium-232	18.67
Uranium-234	2.54
Uranium-238Lead-210	2.54

Source:

Oak Ridge Associated Universities. *Radiological Survey of the SCA Chemical Services, Inc., Landfill Site, Bay City, Michigan.* July 1985. (ORAU, 1985a)

Table 5-6
Calculated Radiation Exposures
SCA Hartley & Hartley Landfill Site
Kawkawlin Township, Michigan

LOCATION	DESCRIPTION	CALCULATED RADIATION EXPOSURE (mrem/year)
Northwest Landfill	Industrial worker	5~~1.4~~
Northwest Landfill	No controls in place[1]	312
Surface soil	DCGLs in soil outside of the Northwest Landfill	24.6
	NRC limit for unrestricted release	25

(1) Assumes the cover over the Northwest Landfill is removed, the slag is disturbed, and that a resident farm family uses groundwater as their source of drinking water.

Attachment 1B

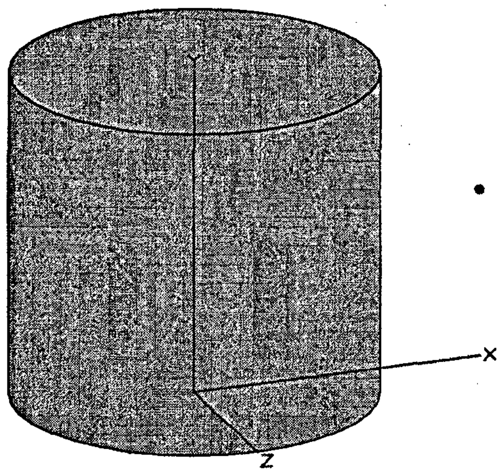
MicroShield Analysis

MicroShield v5.01 (5.01-00996)
Integrated Environmental Management, Inc.

Page : 1
DOS File : HH051109.MS5
Run Date : November 14, 2005
Run Time: 1:53:23 PM
Duration : 00:00:07

File Ref: ________
Date: ________
By: ________
Checked: ________

Case Title: SCA Services
Description: Calculate Exposure to Workers During LCTS Operations
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	290.0 cm	9 ft 6.2 in
Radius	157.0 cm	5 ft 1.8 in

Dose Points

	X	Y	Z
# 1	257.64 cm	150 cm	0 cm
	8 ft 5.4 in	4 ft 11.1 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	2.25e+07 cm³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.64 cm	Iron	7.8
Top Clad	.64 cm	Iron	7.8

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Pb-210	9.0277e-006	3.3403e+005	4.0200e-007	1.4874e-002
Ra-226	1.5540e-005	5.7498e+005	6.9200e-007	2.5604e-002
Ra-228	6.1008e-002	2.2573e+009	2.7167e-003	1.0052e+002
Th-228	6.1008e-002	2.2573e+009	2.7167e-003	1.0052e+002
Th-230	6.1008e-002	2.2573e+009	2.7167e-003	1.0052e+002
Th-232	6.1008e-002	2.2573e+009	2.7167e-003	1.0052e+002

Buildup
The material reference is : Source

Integration Parameters

Radial	10
Circumferential	10
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0465	1.353e+04	3.758e-11	3.880e-09	1.162e-13	1.200e-11
0.059	4.289e+06	5.782e-06	5.454e-04	1.174e-08	1.107e-06
0.0677	8.420e+06	1.002e-04	7.621e-03	1.753e-07	1.333e-05
0.0811	1.036e+03	8.871e-08	4.611e-06	1.397e-10	7.262e-09
0.0838	1.721e+03	1.948e-07	9.381e-06	3.038e-10	1.463e-08
0.0844	2.731e+07	3.273e-03	1.550e-01	5.094e-06	2.413e-04
0.0949	7.804e+02	2.155e-07	7.719e-06	3.298e-10	1.181e-08
0.125	9.481e+05	9.781e-04	1.911e-02	1.541e-06	3.011e-05

DOS File : HH051109.MS5
Run Date: November 14, 2005
Run Time: 1:53:23 PM
Duration : 00:00:07

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.1316	2.799e+06	3.462e-03	6.133e-02	5.519e-06	9.776e-05
0.1681	1.556e+06	3.871e-03	4.683e-02	6.559e-06	7.936e-05
0.1725	2.592e+06	6.870e-03	8.036e-02	1.172e-05	1.370e-04
0.1862	1.886e+04	5.955e-05	6.337e-04	1.034e-07	1.100e-06
0.216	5.395e+06	2.328e-02	2.077e-01	4.176e-05	3.727e-04
0.3097	3.835e+01	3.234e-07	1.969e-06	6.159e-10	3.750e-09
TOTALS:	5.335e+07	4.190e-02	5.792e-01	7.248e-05	9.738e-04