DEFENSE LOGISTICS AGENCY
DEFENSE NATIONAL STOCKPILE CENTER
8725 JOHN J. KINGMAN ROAD, SUITE 3229
FT. BELVOIR, VIRGINIA 22060-6223

IN REPLY REFER TO DNSC-E

DEC 29 2005

U.S. Nuclear Regulatory Commission
Region 1, Nuclear Materials Safety Branch
Division of Nuclear Materials Safety
ATTN: Ms Betsy Ullrich
475 Allendale Road
King of Prussia, PA 19406-1415

J-6

04000341

Dear Ms Ullrich:

Re: License STC-133

SUBJECT: Amendment to Source Material License STC-133 - Request to Use Commodity Specific DCGLs at Binghamton and Somerville Depots

Dear Ms. Ullrich:

By letter dated October 19, 2005, the Defense National Stockpile Center (DNSC) requested an amendment to the subject license which would permit the assessment of dose and Derived Concentration Guideline Levels (DCGL) with conversion factors from Federal Guidance Report 13, Cancer Risk Coefficients for Environmental Exposure to Radionuclides (EPA 402-R-99-001). The request is limited to the decommissioning efforts at the DNSC Binghamton Depot, Hoyt Avenue, Binghamton, NY, 13901-1699 and the DNSC Somerville Depot, 152 US Highway 206 South, Hillsboro, NJ, 08844-4135.

Please find supporting information attached regarding the sampling results of commodities and the development of surface gross activity DCGLs. A particular storage location would be assigned a DCGL based upon the particular mixture of commodities stored. This process would flow down from the Warehouse to the Bay or survey unit size. When two or more commodities were stored in the same area, the conservative DCGL value would be applied.

Sincerely,

for F. KEVIN REILLY
Director,
Directorate of Environmental
agement

Attachment

137882

NMSS/RGN1 MATERIALS-002

Development of DLA DCGLs for Binghamton and Somerville Depots

1.0 Comparison of DandD and FGR-13 DCGLs

The NRC has released DandD version 2.1 for use by radioactive materials licensees. The program includes the ability to calculate DCGLs for natural thorium and natural uranium. For this evaluation, reverse engineering was applied and 10,000 simulations were run to assure that the estimated DCGLs would not exceed 25.0 mrem per year. The estimated DCGLs for the Building Occupancy Scenario were 5.9 and 92.9 dpm/100cm^2 for natural thorium and natural uranium, respectively. Results of the DandD computer runs are readily available.

Multiples of individual radionuclide dose factors from FGR-11 to FGR-13 were then applied to determine the dose that would be calculated if the DandD code used FGR-13 dose factors. This was performed for both the ingestion and inhalation pathways with the external pathway held constant. The dose was reduced by a factor of 2.71 and 1.55 for natural thorium and natural uranium, respectively. These factors were applied to the DandD DCGLs. The results are shown in Table 1.

When Th-232 is in equilibrium with its progeny, there are six alpha emissions for each decay of a Th-232 atom. When natural uranium is in equilibrium with its progeny, there are seven alpha emissions for each decay of a U-238 atom. Application of the number of alpha emissions to the DCGLs yields higher values. These are also shown in Table 1.

Table 1. DCGL Comparisons

Reference	DCGL (dpm/100cm^2)	
	Th-nat	U-nat
DandD	5.9	92.9
Alpha Based w DandD	35.1	650
FGR-13	15.9	144
Alpha Based w FGR-13	95	1008

2.0 Commodity Specific DCGLs at the Binghamton Depot

From the known concentrations per commodity by lot, a dpm per gram ratio was established and then multiplied by the number of alphas emitted in the decay scheme. An alpha emission ratio was established per lot and the gross activity $DCGL_{alpha}$ was determined per the following equation.

$$GrossActivityDCGL_{alpha} = \frac{1}{\left(\frac{fi}{DCGL_1} + \frac{f_2}{DCGL_2}\right)}$$

Where: f_1 is the alpha fraction for natural thorium

f_2 is the alpha fraction for natural uranium

$DCGL_1$ is the alpha DCGL for natural thorium

$DCGL_2$ is the alpha DCGL for natural uranium

As an example, values for the Ferberite commodity Lot 1 as indicated in Table 2 with DCGLs from Table 1 are provided.

$$GrossActivityDCGL_{alpha} = \frac{1}{\left(\frac{0.961}{95} + \frac{0.039}{1008}\right)} \text{ αpm/100cm}^2$$

$$GrossActivityDCGL_{alpha} = 99 \text{ αpm/100cm}^2$$

A $DCGL_{alpha}$ value for each lot of the Ferberite and Wolframite commodities are shown in Table 2. As several tests were performed on the Columbium material, a $DCGL_{alpha}$ value is given for the average, the high thorium content, and the high uranium content. As expected for the Ferberite commodity, when the alpha emissions from thorium are much larger than those from uranium, the $DCGL_{alpha}$ approaches the DCGL for natural thorium indicated in Table 1 above. As the Columbium material contains some quantity of thorium, the $DCGL_{alpha}$ are somewhat lesser than that for natural uranium.

Table 2. Binghamton Surface Gross Activity DCGLs

Commodity	Lot	Emissions Ratio		DandD DCGL		FGR-13 DCGL	
		Th Alpha	U Alpha	dpm/ 100cm²	αpm/ 100cm²	dpm/ 100cm²	αpm/ 100cm²
Ferberite	1	24.7	1	6	36	16	99
	2	25.5	1	6	36	16	98
	3	23.9	1	6	36	16	99
	4	12.0	1	6	38	17	102
	5	11.7	1	6	38	17	102
	6	5.6	1	7	41	18	110
Wolframite	2753B	1.2	1	10	61	26	160
	2753A	1.5	1	9	57	25	149
	2628B	0.7	1	13	79	33	204
Columbium	Average	1	16.1	50	321	98	646
	Th high	1	1.8	15	91	37	230
	U high	1	30.3	63	417	114	771

3.0 Commodity Specific DCGLs at the Somerville Depot

The process described was applied to the known concentrations per commodity by lot at the Somerville Depot. An alpha emission ratio was established per lot and the gross activity $DCGL_{alpha}$ was determined.

A $DCGL_{alpha}$ value for each lot of the Tungsten Metal Scrap and Tantalum Natural Minerals are shown in Table 3. As expected for the Tungsten Metal Scrap, when the alpha emissions from thorium are much larger than those from uranium, the $DCGL_{alpha}$ approaches the DCGL for natural thorium indicated in Table 1. This is also expected in

that Tantalum natural minerals contain some quantity amount of thorium, the $DCGL_{alpha}$ are somewhat lesser than that for natural uranium.

Table 2. Somerville Surface Gross Activity DCGLs

Commodity	Lot	Emissions Ratio		DandD DCGL		FGR-13 DCGL	
		Th Alpha	U Alpha	dpm/ 100cm^2	αpm/ 100cm^2	dpm/ 100cm^2	αpm/ 100cm^2
Tungsten Metal Scrap	1	80	1	6	36	16	96
	2	606	1	6	35	16	95
	6	730	1	6	35	16	95
Tantalum Natural Minerals	A	1	22.2	57	370	107	713
	B	1	15.5	49	315	97	637
	C	1	23.3	58	378	108	723
	D	1	20.9	55	361	105	700
	E	1	19.9	54	354	104	691
	F	1	17.7	52	336	101	666
	G	1	14.6	48	307	95	625