SHIELDALLOY METALLURGICAL CORPORATION

12 WEST BOULEVARD
P.O. BOX 768
NEWFIELD, NJ 08344-0768
TELEPHONE (856) 692-4200

DAVID R. SMITH
ENVIRONMENTAL MANAGER
Aluminum Products & Powders Division

August 13, 1999

Mr. Theodore S. Sherr, Chief
Chief, Licensing and International Safeguards Branch
Division of Fuel Cycle Safety and Safeguards, NMSS
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Re: Response to USNRC Request for a License Amendment Application

Dear Mr. Sherr:

In letters dated January 21, and July 14, 1999, Region I of the U. S. Nuclear Regulatory Commission (USNRC) requested that Shieldalloy Metallurgical Corporation (SMC) prepare a formal request to support the release of certain areas outside the fence line of SMC's Newfield site.[1,2] The letters reflect the apparent view that survey results show the presence of licensed material outside the fence at levels above the site-specific release criteria. The basis for the USNRC's request appears to be the results of soil sampling campaigns by the U. S. Environmental Protection Agency,[3] and the U. S. Nuclear Regulatory Commission.[4] SMC respectfully submits that the survey results cited in the above letters do not support the conclusion that licensed materials have migrated outside the fence at levels above the site-specific release criteria. The basis for our conclusion is as follows:

- The land area north of the SMC property boundary is the site of a former municipal landfill. Over the years, a variety of materials were disposed of in this location, with the preponderance being from glass manufacturing operations.[5] Naturally-occurring radioactive materials, including thorium and uranium, are commonly associated with glass and ceramic manufacturing, both in the product and waste streams, in refractory materials used as part of the process, and in liquid waste handling systems.[6]

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[1]Written communication from J. D. Kinneman, U. S. Nuclear Regulatory Commission, to E. Jackson, Shieldalloy Metallurgical Corporation, "Inspection No. 040-07102/98-001", July 14, 1999.

[2]U. S. Nuclear Regulatory Commission, Notice of Violation to Shieldalloy Metallurgcal Corporation, January 21, 1999.

[3]Letter from Carole Peterson, U. S. Environmental Protection Agency, to Michael Weber, U. S. Nuclear Regulatory Commission, plus supplemental analytical results, October 17, 1997.

[4]U. S. Nuclear Regulatory Commission, Inspection Report No. 040-07102/98-001, August 27, 1998.

[5]U. S. Environmental Protection Agency, "Hazardous Waste Site Investigation - Newfield Landfill, Newfield, New Jersey", December 10, 1979.

[6]National Council on Radiation Protection and Measurements, NCRP Report No. 95, Radiation Exposure of the U. S. Population from Consumer Products and Miscellaneous Sources", Bethesda, Maryland, 1987.

- Although SMC has received some USEPA-generated analytical results which the USNRC Staff has stated are from soil samples collected north of our property boundary, we have not been provided with the sample collection location, sample volumes, dates/times of collection, associated quality control information, nor any opportunity to analyze "splits" of the samples. We thus have no idea whether the samples are representative of conditions at the landfill, whether they can be considered valid, or whether they can be reconfirmed through subsequent sampling campaigns.

- The samples collected by the USNRC cannot be traced to an exact collection location. The August 27, 1998 Inspection Report No. 040-07102/98-001 merely states that the samples were "taken outside the fence line". If radioactive material had indeed migrated offsite, one would expect concentrations offsite to be lower than those on-site. In fact, the NRC sample results show off-site concentrations are higher than those collected onsite. In addition, the USNRC analysis of these samples used gamma spectroscopy methods rather than isotope-specific methods, in spite of the fact that the radionuclides of interest in this issue, thorium-232 and uranium-238, cannot be specifically identified by this method.

- SMC can find no evidence that its Newfield facility operation ever used the landfill in question for disposal of any materials generated at the site.

- In order to demonstrate that a site or land area may be released for unrestricted use, methods and procedures adopted by the USNRC, the USEPA and other federal agencies for sample collection, analysis, data validation, and interpretation should be used.[7] Because neither the USEPA nor the USNRC used these methods, it is inappropriate for either agency to conclude, one way or another, whether (1) the land area in question exceeds some pre-determined release criteria and (2) whether the residual radioactivity in that land area is the result of SMC licensed operations.

SMC believes that any residual radioactivity that may be present in the land area north of our property boundary is not the result of SMC licensed operations. The sample data reported by USEPA and USNRC can be neither verified nor validated, and there is no evidence that the radioactivity contained in the USEPA's and USNRC's samples came from SMC's Newfield site. Therefore, it would be inappropriate to amend License No. SMB-743 to reflect release of the land area north of the Newfield sitefor unrestricted use. SMC was requested, in a July 21, 1999 telephone conversation, that a formal presentation of data is necessary in order to resolve this outstanding inspection issue.[8] In order to satisfy this request, we have compared the USEPA and the USNRC soil sampling results in question, without regard for the fact that we cannot validate their accuracy or applicability, to background soil sampling results for the same radionuclides.

For this comparison, we have used the two-sample Wilcoxon Rank Sum (WRS) statistical test recommended by the USNRC in Section 8.4.1 of MARSSIM. This test is typically used to compare the results of two populations in cases where the residual radioactivity in question is normally present in background, as is the case in this evaluation. As set forth in MARSSIM, the null hypothesis, H_0, for the WRS test is that the median concentration of uranium or thorium in the samples collected by the USEPA and the USNRC from ouside of the north fence line exceeds the background concentrations of the same radionuclides by greater than the "release criteria".

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[7]U. S. Nuclear Regulatory Commission, NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)", December, 1997.

[8]Telephone conversation between Elizabeth Ulrich, C.H.P., U. S. Nuclear Regulatory Commission and David R. Smith, R.S.O., Shieldalloy Metallurgical Corporation, July 21, 1999.

The release criteria, in this case, are those in the USNRC Branch Technical Position, which are 10 pCi per gram of natural thorium (thorium-232 and thorium-228) and natural uranium (uranium-238 and uranium-234).[9] To satisfy the unity rule, if these radionuclides are assumed to be present in relatively equal ratios, the release criterion for each is 2.5 pCi per gram above background.[10]

It is important to note that some of the thorium and uranium concentrations reported by the USEPA and USNRC may, indeed, be higher than some or all of the background area concentrations. This does not mean that the release criteria have not been met. Since the intention of this test is to demonstrate whether the USEPA/USNRC data set, as a whole, meets the release criteria, comparison of individual sample results to any background value (or collection of values) serves no purpose.

Although the procedure for performing the WRS Test is described in detail in MARSSIM, a brief summary is presented herein. For this test, the release criterion for each radionuclide is *added* to each "background" measurement result for the same radionuclide. This adjusted data set is then *combined* with USEPA/USNRC measured results for the same radionuclide. The entire data set is then *sorted* from low to high concentration, and ranks are assigned to each value.[11] The ranks from the adjusted background data set only are *summed and compared* to a "critical value", which is selected based upon the level of confidence desired in the evaluation, the number of USEPA/USNRC samples, and the number of background samples.

Attachment 1 shows the entire data set used for the WRS Test, along with notations as to the usability of the data points. The USEPA data and supporting information appeared in a September 10, 1997 letter, plus attachments.[12] The USNRC data and supporting information were described in the August 27, 1998 inspection report.[13] The ENSR and IEM data sets, including sample collection locations and other supporting information appear in separate reports.[14,15] The following are additional assumptions made in the performance of the WRS test using the data in Attachment 1:

- In the case of the USNRC data, radionuclide concentrations were not reported for the two thorium isotopes and the two uranium isotopes in the Branch Technical Position. Instead, radionuclides known to be a part of the uranium and thorium decay series, but that emit gamma rays, were reported. For this evaluation, it was conservatively assumed that the actinium-228 concentration reported by the USNRC is equivalent to the thorium-232 concentration present in the sample.[16] Likewise, the USNRC's protactinium-234m

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[9]U. S. Nuclear Regulatory Commission's Branch Technical Position, "Disposal or Onsite Storage of Thorium or Uranium Wastes From Past Operations", 46 FR 52061, October 23, 1981.

[10]These criteria are considered conservative since, for the purposes of defining what elevated radionuclide concentrations are for naturally-occurring radioactivity, the USEPA published values (64 FR 13113), dated March 17, 1999) are greater than 7.6 pCi/g of Uranium-238 or 6.8 pCi/g of Thorium-232.

[11]As necessary, "tied" values are assigned the average rank of the group of tied measurements.

[12]Memorandum from J. Griggs, U. S. Environmental Protection Agency, Monitoring and Analytical Services Branch, to M. P. Winslow, U. S. Environmental Protection Agency, Radiation Health and Safety Program, September 10, 1997, plus attachments.

[13]U. S. Nuclear Regulatory Commission, Inspection Report No. 040-07102/98-001, August 27, 1998.

[14]IT Corporation, "Assessment of Environmental Radiological Conditions at the Newfield Facility", Report No. IT/NS-92-106, April 2, 1992.

[15]Integrated Environmental Management, Inc., Report No. 94005/G-5169, "Report of Radiation Safety Surveillance for Quarter 3, 1998" (draft), October, 1998.

[16]This assumption might be very conservative if any waste material associated with Radium-228 production and use were disposed of in the Newfield landfill.

concentrations were taken to be conservatively equivalent to the uranium-238 concentrations in the samples.

- Because the Branch Technical Position requires the inclusion of all four radionuclides if all four are known to be present, and because there is no reason to believe that all four were not present in the samples collected by the USEPA and the USNRC, it is conservatively assumed that the thorium-228 concentrations are equal to the reported thorium-232 concentrations. Likewise, it is conservatively assumed that the uranium-234 concentrations are equal to the reported uranium-238 concentrations.

- With one exception, all data points are taken to be valid, are assumed to be independent and randomly-distributed samples, and are assumed to be independent of every other measurement. The exception refers to the three results reported for USEPA Sample NF8. The first result for No. NF8 appears consistent with the remainder of the samples collected. However, the triplicate analyses (No. NF8d and NF8d2) show significantly elevated uranium-238 concentrations. Not only are these two results internally inconsistent with the first result, they clearly exclude the possibility of SMC being a contributor to the residual radioactivity based upon the ratio of thorium-to-uranium.[17] Therefore, the results of NF8d and NF8d2 were excluded from the WRS Test.

- For this analysis, there are a total of 15 USEPA/USNRC data points, and a total of 19 background data points. Therefore, assuming a 95% confidence limit for accepting the null hypothesis when it is true (i.e., $\alpha = 0.05$), the "critical value" for the WRS Test is 380.[18]

Attachment 2 shows the results of the WRS Test for the thorium-232 and thorium-228 concentrations in the USEPA/USNRC and the background data sets. Attachment 3 shows the results for the uranium-238 and uranium-234 concentrations. In both cases, the sum of ranks *exceeds* the critical value. Therefore, the null hypothesis, H_0, is rejected, meaning that the concentrations reported for the USEPA/USNRC data set *do not*, on average, exceed the background concentrations by greater than the applicable release criteria (i.e., 2.5 pCi per gram for each radionuclide).

At the October 1, 1998 enforcement conference, SMC presented a similar analysis of the survey results and described why those results did not indicate that there had been a migration of licensed materials beyond the fence line. The enforcement conference report states that after the enforcement conference, the USNRC inspectors concluded that the "difference between the survey unit average and reference area average exceeded the site-specific release criteria".[19] Based upon the analysis presented in this letter, which follows the USNRC's own methodology as described in MARSSIM, SMC respectfully submits that this conclusion is incorrect. Because the null hypothesis, H_0, is rejected, one must conclude that the difference between the "survey unit average" and the "reference area average" is less than the site-specific release criteria.

To summarize, SMC does not believe that its Newfield operations have had any impact on the adjacent landfill for three reasons. First, SMC is not aware of any waste material from the Newfield site being disposed of in the landfill. Secondly, those analytical data that do exist do not support a migration pattern from the SMC site onto the landfill. Lastly, the statistical testing of the radiological data available on the landfill do not support above-background concentrations of uranium and thorium being present.

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[17]For samples with uranium and thorium concentrations that are clearly above background, SMC has never observed a thorium-to-uranium ratio as low as it appears in the Sample No. NF8 triplicate results.

[18]U. S. Nuclear Regulatory Commission, NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)", Appendix I, Table I.4, "Critical Values for the WRS Test", December, 1997.

[19]Enforcement Conference Report No. 040-07102/98-001, page 5, attached to January 21, 1999 letter from USNRC.

On this basis, SMC submits that no formal request to support the release of any area outside the Newfield fence line is warranted or appropriate. Whatever residual radioactivity may be present in that location cannot be reasonably attributed to SMC operations. We would, however, be pleased to discuss this issue with you and USNRC technical staff members, at your convenience, in either a meeting or telephone conference. In the meantime, please call me at (609) 692-4200, extension 226 if I can answer any questions, or provide you with additional information.

Sincerely,

David R. Smith
Radiation Safety Officer

cc: Nigel C. Morrison
Mary B. Higgins
James P. Valenti
Hugo L. Nieves
Lidia M. Stasiuk
Steve Danilak
Paul A. Gonzales
Ellen Harmon, Esq.- Metallurg
Jay E. Silberg, Esq. - Shaw Pittman
Carol D. Berger - IEM
John Kinneman - USNRC Region 1
Edward Shum - USNRC Licensing Section 2
Penny Lanzisera - USNRC Region 1

ATTACHMENT 1
Analytical Data

Area**	Sample ID	Collecting Organization	Radionuclide Concentration (pCi/g)		Comments	Result Included in analysis?
			Thorium-232	Uranium-238		
S	NF1	USEPA	6.190	9.32		Yes
S	NF2	USEPA	12.900	6.94		Yes
S	NF3	USEPA	0.528	0.322		Yes
S	NF4	USEPA	0.666	0.287		Yes
S	NF5	USEPA	0.357	0.228		Yes
S	NF6	USEPA	0.786	0.43		Yes
S	NF7	USEPA	0.567	0.311		Yes
S	NF7d	USEPA	0.478	0.441		Yes
S	NF8	USEPA	0.430	0.261		Yes
S	NF8d	USEPA	0.255	38.5	Internally inconsistent and not typical of SMC materials	No
S	NF8d2	USEPA	0.216	38.3	Internally inconsistent and not typical of SMC materials	No
S	NF9	USEPA	0.286	0.297		Yes
S	NF10	USEPA	0	0.323		Yes
S	S1	USNRC	1.940	1	Thorium and uranium Isotopic results not reported (gamma spec only)	Yes. Progeny used to predict concentration of parent.
S	S2	USNRC	17.100	7.6	Thorium and uranium Isotopic results not reported (gamma spec only)	Yes. Progeny used to predict concentration of parent.
S	S3	USNRC	1.860	2	Thorium and uranium Isotopic results not reported (gamma spec only)	Yes. Progeny used to predict concentration of parent.
S	S4	USNRC	7.510	3.9	Thorium and uranium Isotopic results not reported (gamma spec only)	Yes. Progeny used to predict concentration of parent.
		Mean	3.06	6.50		
		Standard Deviation	5.02	12.36		
R	980715-15	IEM	0.900	0.500		Yes
R	980715-16	IEM	1.100	0.200		Yes
R	091898-01	IEM	1.800	1.700		Yes
R	091898-02	IEM	1.400	1.000		Yes

Area**	Sample ID	Collecting Organization	Radionuclide Concentration (pCi/g)		Comments	Result Included in analysis?
			Thorium-232	Uranium-238		
R	091898-03	IEM	0.900	0.800		Yes
R	091898-04	IEM	1.400	0.600		Yes
R	091898-05	IEM	0.600	0.600		Yes
R	091898-06	IEM	0.600	0.500		Yes
R	091898-07	IEM	1.200	0.500		Yes
R	091898-08	IEM	0.600	0.900		Yes
R	S7	USNRC	0.330	0.900	Thorium and uranium isotopic results not reported (gamma spec only)	Yes
R	ENSR-1	ENSR	1.480	0.830		Yes
R	ENSR-2	ENSR	0.280	1.380		Yes
R	ENSR-3	ENSR	1.910	1.370		Yes
R	ENSR-4	ENSR	1.680	0.920		Yes
R	ENSR-5	ENSR	1.190	1.040		Yes
R	ENSR-6	ENSR	1.350	0.420		Yes
R	J76.5	ENSR	1.710	0.860		Yes
R	J76.5d	ENSR	1.87	0.99		Yes
		Mean	1.17	0.84		
		Standard Deviation	0.52	0.37		

** S = USEPA/USNRC data point; R = background data point

ATTACHMENT 2
Results of WRS Test for ^{232}Th and ^{228}Th
(DCGL = 2.5 pCi/g)

Area	Sample ID	Agency	Activity (pCi/g)	Activity + DCGL (pCi/g)	Rank	Reference area Rank
S	NF10	EPA	0.00	0	1.0	0
S	NF9	EPA	0.29	0.29	2.0	0
S	NF5	EPA	0.36	0.36	3.0	0
S	NF8	EPA	0.43	0.43	4.0	0
S	NF7d	EPA	0.48	0.48	5.0	0
S	NF3	EPA	0.53	0.53	6.0	0
S	NF7	EPA	0.57	0.57	7.0	0
S	NF4	EPA	0.67	0.67	8.0	0
S	NF6	EPA	0.79	0.79	9.0	0
S	S3	NRC-GS	1.86	1.86	10.0	0
S	S1	NRC-GS	1.94	1.94	11.0	0
R	ENSR-2	ENSR	0.28	2.78	12.0	12
R	S7	NRC	0.33	2.83	13.0	13
R	091898-08	IEM	0.60	3.10	15.0	15
R	091898-06	IEM	0.60	3.10	15.0	15
R	091898-05	IEM	0.60	3.10	15.0	15
R	980715-15	IEM	0.90	3.40	17.5	17.5
R	091898-03	IEM	0.90	3.40	17.5	17.5
R	980715-16	IEM	1.10	3.60	19.0	19
R	ENSR-5	ENSR	1.19	3.69	20.0	20
R	091898-07	IEM	1.20	3.70	21.0	21
R	ENSR-6	ENSR	1.35	3.85	22.0	22
R	091898-02	IEM	1.40	3.90	23.5	23.5
R	091898-04	IEM	1.40	3.90	23.5	23.5
R	ENSR-1	ENSR	1.48	3.98	25.0	25
R	ENSR-4	ENSR	1.68	4.18	26.0	26
R	J76.5	ENSR	1.71	4.21	27.0	27
R	091898-01	IEM	1.80	4.30	28.0	28
R	J76.5d	ENSR	1.87	4.37	29.0	29
R	ENSR-3	ENSR	1.91	4.41	30.0	30
S	NF1	EPA	6.19	6.19	31.0	0
S	S4	NRC-GS	7.51	7.51	32.0	0
S	NF2	EPA	12.90	12.90	33.0	0
S	S2	NRC-GS	17.10	17.10	34.0	0
					SUM	399.00

ATTACHMENT 3
Results of WRS Test for ^{238}U and ^{234}U
(DCGL = 2.5 pCi/g)

Area	Sample ID	Agency	Activity (pCi/g)	Activity + DCGL (pCi/g)	Rank	Reference area Rank
S	NF10	EPA	0.00	0.00	1.0	0
S	NF9	EPA	0.29	0.29	2.0	0
S	NF5	EPA	0.36	0.36	3.0	0
S	NF8	EPA	0.43	0.43	4.0	0
S	NF7d	EPA	0.48	0.48	5.0	0
S	NF3	EPA	0.53	0.53	6.0	0
S	NF7	EPA	0.57	0.57	7.0	0
S	NF4	EPA	0.67	0.67	8.0	0
S	NF6	EPA	0.79	0.79	9.0	0
S	S3	NRC-GS	1.86	1.86	10.0	0
S	S1	NRC-GS	1.94	1.94	11.0	0
R	ENSR-2	ENSR	0.28	2.78	12.0	12
R	S7	NRC	0.33	2.83	13.0	13
R	091898-08	IEM	0.60	3.10	15.0	15
R	091898-06	IEM	0.60	3.10	15.0	15
R	091898-05	IEM	0.60	3.10	15.0	15
R	980715-15	IEM	0.90	3.40	17.5	17.5
R	091898-03	IEM	0.90	3.40	17.5	17.5
R	980715-16	IEM	1.10	3.60	19.0	19
R	ENSR-5	ENSR	1.19	3.69	20.0	20
R	091898-07	IEM	1.20	3.70	21.0	21
R	ENSR-6	ENSR	1.35	3.85	22.0	22
R	091898-02	IEM	1.40	3.90	23.5	23.5
R	091898-04	IEM	1.40	3.90	23.5	23.5
R	ENSR-1	ENSR	1.48	3.98	25.0	25
R	ENSR-4	ENSR	1.68	4.18	26.0	26
R	J76.5	ENSR	1.71	4.21	27.0	27
R	091898-01	IEM	1.80	4.30	28.0	28
R	J76.5d	ENSR	1.87	4.37	29.0	29
R	ENSR-3	ENSR	1.91	4.41	30.0	30
S	NF1	EPA	6.19	6.19	31.0	0
S	S4	NRC-GS	7.51	7.51	32.0	0
S	NF2	EPA	12.90	12.90	33.0	0
S	S2	NRC-GS	17.10	17.10	34.0	0
					SUM	520