February 20, 1992

MEMORANDUM FOR: Douglas M. Collins, Chief
Radiological Protection and Emergency
Preparedness Branch
Division of Radiation Safety and
Safeguards, Region II

FROM: John W. N. Hickey, Chief
Fuel Cycle Safety Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

SUBJECT: INTERPRETATION OF THORIUM SURFACE DECONTAMINATION LIMITS

I am responding to Mr. J. Henson's request to provide an interpretation of thorium surface decontamination limits specified in Table 1 of "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source and Special Nuclear Material" (See Enclosure). We hope this will be helpful to you in conducting confirmatory surveys for license termination. If you have further questions, please call Dr. Edward Shum of my staff at 301-504-2607.

Sincerely,

Mike Tokar for

John W. N. Hickey, Chief
Fuel Cycle Safety Branch
Division of Industrial and
Medical Nuclear Safety
Office of Nuclear Material Safety
and Safeguards

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Enclosure: As stated
cc: J. Henson, RII

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[ES/COLLINS MEMO]

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ENCLOSURE

INTERPRETATION OF THORIUM SURFACE DECONTAMINATION LIMITS SPECIFIED IN TABLE 1 OF "GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE AND SPECIAL NUCLEAR MATERIAL" (and the identical limits in Regulatory Guide 1.86)

In Table 1, the average and maximum acceptable surface contamination levels for thorium are 1000 dpm/100 $cm^2$ and 3000 dpm/100 $cm^2$ respectively. The limits were originally derived from the grouping of radionuclides having similar $MPC_a$ and $MPC_w$ concentrations (Maximum permissible concentrations in air and water from 10 CFR Part 20 Appendix B). The grouping of radionuclides in Table 1 therefore reflects the various radiotoxicity levels and type of radioactivity. The radionuclides in the same group with thorium consist of alpha and beta-gamma emitters. Thorium with its daughter products, together, consist of alpha and beta-gamma emitters. Footnote [a] in Table 1 states that where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply separately. Therefore, for surface contamination involving thorium and its associated products, the average 1000 dpm/100 $cm^2$ and maximum 3000 dpm/100 $cm^2$ should apply to both alpha- and beta-gamma measurements independently.

The limits of 5000 dpm beta-gamma/100 $cm^2$ applies to a different group of radionuclides, with decay modes other than alpha emission or spontaneous fission.

It should not be applied to thorium. Although thorium may have been originally processed to separate its daughter products, its daughter products will grow back in 30-40 years. Therefore, natural thorium (Th-nat) defined as Th-232 and Th-228, is always associated with its daughter products, for purposes of decontamination and release for unrestricted use.