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THE FOLLOWING FACSIMILE IS BEING SENT FROM RADIATION SCIENCE, 10 South River Road, Cranbury, NJ 08512:

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OF: HMI

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NMSS/RGNI MATERIALS-002

Radiation Science Inc.
10 South River Road
Cranbury, NJ 08512

April 22, 2002

Mr. John Lord
Hovnanian Industries
One Hovchild Plaza
4000 Rt. 66
Tinton Falls, NJ 07753

Re: Response to the ORISE Report

Dear Mr. Lord:

This letter provides our response to the ORISE report with regard to the mill buildings at the HMI facility. We conclude that ORISE has overstated the activity of any remaining materials, but demonstrated the need for additional cleaning and decommissioning activities prior to the release these facilities. The following paragraphs present our technical arguments and propose an alternative method for proceeding with the release of these facilities.

The mill buildings at Heritage Minerals, Inc. were surveyed for final release by detection of the alpha emission rate to quantify direct and removable characteristics of radioactive contamination. Measurement of the alpha emission rate was chosen to make a practical determination of the activity for comparison against the release criteria in Regulatory Guide 1.86. This simplification is possible for two reasons: 1) alpha particles are easy to distinguish from other radiation using standard survey methods (utilizing energy discrimination), and 2) once corrected for detector efficiency, the conversion between the alpha emission rate and isotopic activity is one-to-one.

ORISE argues however that because the alpha radiation can theoretically be shielded more readily than other types of radiation by rust, paint, or minor debris on the surface of potentially contaminated equipment, and therefore adversely affect detector efficiency, the measurement of alpha radiation alone is insufficient to account for all radioactive material present. ORISE attempts to correct for this problem by using instrumentation setup to detect beta radiation, which is not subject to the same shielding characteristics. Since only the alpha and beta radiation correspond uniquely with decay events, counting hits radiation alone would represent an accurate determination of the activity for comparison against the release criteria. The concept deserves merit but the ORISE procedure is inherently flawed because their methods lack ability to distinguish between concurrent beta and gamma radiation.

Because gamma radiation varies with yield (there can be as many as 200 gamma rays emitted per decay event) and energy (most of the gamma rays are emitted in the low energy spectrum), it is only possible to associate gamma rays with individual decay events using proportional counting methods. Although ORISE used gas proportional detectors to perform their survey, ORISE employed single channel analyzers, with no energy threshold or window to process the proportional signal. Thus, ORISE cannot distinguish between beta particles that deposit their energy in the gas volume of the detector and electrons that are "knocked" into the gas volume as a result of gamma rays "striking" the detector wall. Therefore, it is our opinion that the activity measured by the ORISE technique "counts" multiple gamma ray emissions and interprets these counts as individual decay events, hence grossly overstating the true activity.

A crude approximation of the overstatement can be obtained by a simple experiment (described in more detail below). Placing a 3/8" Plexiglas shield between the detector and source while maintaining the source to detector geometry will eliminate the beta component and allow an estimation of the overstatement. The results of estimating the gamma contribution by this method imply that the measured

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count rate is overstated by as much as 33%. If we take 33% off the ORISE numbers, the picture looks much different inside the mills. Instead of the broad conclusion that nothing is releasable, the picture is one of a few isolated hotspots or accumulations of material in hard to reach places.

Still, both ORISE's and RSI's data raise the question of what efficiency to apply to the count rate to properly convert the measured count rate to dpm. Alpha counting raises the issue of geometric efficiency (a practical concern), while attempting to count beta radiation raises questions regarding the more theoretical concerns of energy efficiency and detector response. It seems that neither is sufficient alone to determine an acceptable release.

Perhaps the most practical solution is presented in the ORISE report itself. The report quotes the 1991 NRC guideline for exposure rates at one meter above building surfaces as being 5 μR/h above ambient background. Since this methodology measures only the gamma emissions that are not affected by shielding concerns and the acceptable exposure rate has been determined based on the NRC's radiological considerations, then perhaps this should be used as the criteria for release of equipment from the mills.

Applying this criterion to the standing buildings and equipment will be a daunting task. From a practical sense, the mill buildings probably present more of an OSHA hazard to workers than a radiation hazard to the general public. Structurally speaking, the aging portions of the mill buildings probably have not been accessed in years. Many of the obvious construction methods are questionable. Walking on the elevated platforms with missing floor grates alone pose a worker safety issue let alone crawling and climbing over equipment and unsecured work areas. It could be unsafe to perform the cleaning and survey work necessary to free release the mill buildings according to these standards. However, it is practical and possible to disassemble the mill buildings through a process of controlled demolition. Once disassembled with pieces staged in a safe and workable fashion, each piece can be surveyed and cleaned as necessary to warrant free release. Using the 5 μR/h standard, a radiological survey can be performed at ground level in a practical, accurate, and safe manor using a micro-rem meter. If contamination were found, the ground level staging of the piece would make it amenable to rapid disassembly and further cleaning. This would provide the efficiency necessary to continue the demolition process using conventional demolition equipment.

Once the buildings and equipment have been removed, the remaining open slabs could be surveyed according to the same criteria as has been found acceptable for the monazite pile, chiefly to demonstrate that the dose contribution due to any radioactive materials remaining on the slabs is below 10 μR/h above background at one meter.

SUMMARY

It is the opinion of RSI that the mill buildings should be torn down using conventional demolition techniques; the pieces surveyed and further disassembled and cleaned as necessary using power washing equipment. The cleaned pieces should be released and removed from the site as scrap. Any radioactive material collected during the demolition and cleaning process should be removed along with any materials, if any, removed from the monazite pile footprint.

The monazite pile footprint and surrounding area should be further characterized according to the plan set forth by RSI. Any additional materials identified by that process and that contain licensable source material and which HMI cannot reasonably demonstrate were not due to the stored monazite must be addressed by HMI with NRC concurrence.

Once these materials, including any source material collected from the demolition of the mill buildings, have been removed, a dose assessment and final survey should be performed by RSI to

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demonstrate that the remaining licensed property no longer meets the NRC's SDMP criteria and should be removed from that listing and the source material license terminated.

Notes: The overstatement was determined by using the identical equipment used by ORISE under identical operating conditions. That is by using a Ludlum 44-68 gas proportional detector operating at 1700 volts HV and a Ludlum model 12 Survey meter. Note that use of a "gas proportional detector" does not in itself constitute proportional analysis, which is in this case a function of the meter electronics. Rather a simple acrylic shield (approx. 3/8" thickness) is used to shield the alpha and beta radiations, allowing only the gamma component to be counted. Alpha/beta activity is determined by subtracting the gamma component from the total count rate as determined without the shield in place. This is a conservative estimate of the true count rate because the acrylic shield and geometry attenuate some of the low energy gamma and x-rays, understating their contribution to the total count rate.

Sincerely,

Thomas P. Bracke P.E.
cc: Craig Gordon, Anthony Thompson