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From: Marvin Resnikoff <radwaste@rwma.com>
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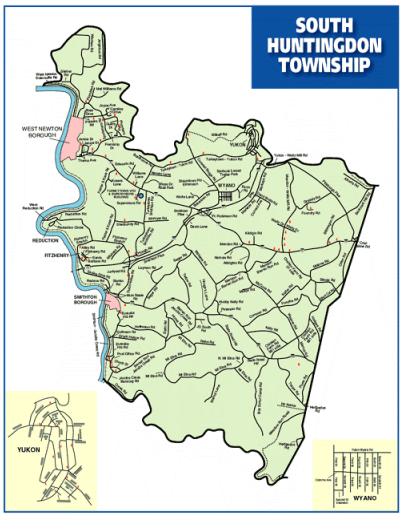
To: Marvin Resnikoff <radwaste@rwma.com>

RWMA Special Bulletin

Radioactive Marcellus shale rock cuttings rejected at PA landfill



In late April 2013, a truck from MAX Environmental Technologies made headlines for setting off a radiation alarm at MAX's landfill in Westmoreland County near South Huntingdon, Pennsylvania. The landfill is a 159-acre site that accepts residual waste and hazardous waste from different locations. Equipped with a radiation alarm on-site, the landfill rejects any waste with a radiation level that reaches 10 microrem/hr or higher. The truckload of material that set off the alarm, coming from Rice Energy's Thunder II pad in Greene County, had a radiation level of 98 microrem/hr- almost 10 times the acceptance amount for that landfill. Pennsylvania DEP instructed MAX to return the materials to the well pad where it was extracted for "subsequent disposal at an approved facility". What is the radioactive concentration of radium-226 and its decay products in the rock cuttings that would yield a gamma dose rate of 98 microrem/hr? We used the program Microshield to find the answer. We assumed the contents of the waste were rock and the truck had steel walls 1/8 of an inch thick. We also assumed the radiation detector was held at a distance of 3 inches from the outside of the truck wall. Additional assumptions are that the measurements were of gamma radiation from Bi-214, not the weak gamma from Ra-226, that is, Ra-226 was in secular equilibrium with its decay products, specifically Bi-214. The steel walls from the truck provided some shielding, but also contributed auxiliary gamma rays. Using the Microshield program, calculations show that to produce a dose rate of 98 microrem/hr, the concentration of Ra-226 would be roughly 330 pCi/g. Alternatively, if you assume the gamma measurement includes background of 10 microrem/hr, the actual reading of 88 microrem/hour (not including the 10 microrem/hr from the background amount), yields a Ra-226 concentration of 300 pCi/g. The MAX landfill was on firm technical ground in rejecting the hot rock cuttings. The EPA has set radium-226 concentrations of 5 pCi/g in the top 6 inches, and 15 pCi/g below 6 inches. These rock cuttings are 20 times the EPA clean-up standard.
These radium-226 concentrations are far higher than we have previously seen in Marcellus shale and deserve further scrutiny.

RWMA is a	**Radioactive Waste Management Associates**

Vermont-based consulting firm established in 1989. Our expert team of scientists and engineers evaluate the impact of proposed and existent radioactive waste facilities to assist States, Local Governments, and Organizations that are faced with nuclear waste management issues.

P.O. Box 105, Bellows Falls, VT 05101
Ph. 802-732-8008 Fax 802-732-8118
radwaste@rwma.com