4/5/82

Jim:

Your first question, how much waste has been disposed at the location, is the key issue to figuring further action. That, plus concentration of those wastes, will give us total loading values (estimates).

Sample from dump area (freshly dumped liquids) *totals

pH	5.9
Al	340 ppm
Ba	20
Cd	.12
Cr	.7
Pb	1.9
Ag	Trace - undetected

According to Gary Nest of Connor Forest:

8 (55) gallon drums/week for four years assuming 52 weeks = 91,520 gallons

$$91.520 \text{ gal} \times \frac{4 \text{ qt}}{\text{gal}} \times \frac{1.06 \text{ l}}{\text{qt.}} = 388{,}045 \text{ l}$$

Al $3.88045 \text{ l} \times 10^5 \times 340 = 131{,}935{,}300$ ppm = 290.3 pounds
Ba $3.88045 \text{ l} \times 10^5 \times 20 = 7.761 \times 10^6$ ppm = 17.08 pounds
Cd $3.88045 \text{ l} \times 10^5 \times .12 = 7.761 \times 10^6$ ppm = 1.02 pounds
Cr $3.88045 \text{ l} \times 10^5 \times .7 = 7.761 \times 10^6$ ppm = .6 pound
Pb $3.88045 \text{ l} \times 10^5 \times 1.9 = 7.761 \times 10^6$ ppm = 1.6 pounds

Aluminum complexes with other ions and is stable in relatively acidic conditions. These complexes are mobile and migrate from upper to lower horizons where a net pH increase may result due to dissociation. A_2 horizon would be purged and materials tied up in B. Aluminum can chelate with metals, especially Fe, and consume some of the exchange capacity. If Fe is present at the interface of 3M and native soil, that is where Al would tie up providing conditions for deeper movement of other parameters.

If you look at what was found out there (at the site), the species are pretty evenly distributed. But the low concentrations suggest downward migration. In water $(Al(OH)_3$'s (reaction of water + Al) solubility products are $Al^{+3} + 3OH^{-1}$. This may account for the rise in pH (relative to background) and chelation of some by $M^{+}S$. (There's about a 1:2 relation of Al:Fe (Table 2). This could be why Ba and Pb dropped in the dump area - nothing to attenuate them. They might be with native soil interface or deeper.

The bottom line is what potential damage can these metals do?

Cr is found naturally at 46,000ppm in some soils. It is not real mobile according to some literature and it is a dietary requirement (to a small degree). I do not think Cr is a problem right now. In the fill Pb and Cd are both readily available for plant uptake, and are pretty hazardous to human health. I do not think these are a problem with the fill because of their concentrations and the duration of disposal. Ba is poisonous in aqueous solution. Looking at the drop from background and the loading from Al it would be nice to know whether this stuff went through to the real soil or complexed with Al in it. It seems as though it is a 3M material contaminant and being washed through by the dumping.

If we sample and find nothing in native soil, we can assume it is attenuated in the fill or else eluted to groundwater.

If we sample and find these parameters in native soil we will have to reevaluate the conditions. If Ba shows up in nearby wells someday, this source could be considered. I agree, we should find out whether their glue characteristics have changed in the last four years. You want to call them on this? If they have changed, we will have to find out what was used. Since we already are testing the biggies (heavy metals), we will be concerned with organics.

We ought to have an idea of what the fill is composed of.