

TO MARK CAPUTO, Township of Roxbury Health Officer and colleagues

FROM Michael Gochfeld MD, PhD and Paul Liroy, PhD March 21, 2014

Dear Mark,

With reference to your recent inquiry about "chronic exposure" and particularly applicability of the EPA RFC of 1.4 ppb. We did think your analogy was appropriate. Here is our interpretation which you may circulate or use as appropriate. We think your action level at 100 ppb is protective of health for acute exposure.

The 1.4 ppb value for the EPA's Reference Concentration does not deal with acute exposures

Not surprisingly, however, some people may assume that the Reference Concentration of 1.4 ppb level is a significant public health level.

Interested individuals who want details about the EPA procedure for deriving this value can go to the EPA Integrated Risk Information System (IRIS) web site to read about the derivation of the Reference Concentration

The IRIS web site for hydrogen sulfide <http://www.epa.gov/iris/subst/0061.htm>

For clarification, we are providing the following quote from the web site and a brief interpretation of how to use it:

*"In general, the RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily inhalation exposure of the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime."*

We emphasize the words "without an appreciable risk" and "lifetime".

More specifically, the RfC is based on a ten week nasal irritation study in rats. During ten weeks exposure to 0.64 milligrams of hydrogen sulfide per cubic meter of air (about 420 ppb) there were no adverse results. EPA lists this as a NOAEL (no observed adverse effect level) which means that there was NO IRRITATION at 420 ppb.

Then, using its risk assessment methodology, EPA developed a "A composite uncertainty factor of 300" which takes into account the fact that the study was relatively short in duration ("subchronic"), and that it was an animal study, rather than a human study. When they divide 420 ppb by 300, they end up with 1.4 ppb, as the level "that is likely to be without an appreciable risk of deleterious effects during a lifetime."

The EPA also identifies the lowest observed adverse effect level (LOAEL) in the rats which occurred at 1.9 milligrams/cubic meter of air, equivalent to about 1300 ppb.

Therefore 1.4 ppb is level is not associated with health effects for chronic exposure over a 40+ year lifetime while 1300 ppb is a level at which irritation can occur. There is a broad gap between these two numbers.

The EPA Acute Exposure Guideline for 8 hours of 330 ppb is a level at which some symptoms might occur, so a chronic guideline would have to be below that level.

Probably the most useful value for evaluating chronic exposure is the ATSDR intermediate duration Minimal Risk Level of 20 ppb .

This is also a level with safety factors at which there should be no adverse health effects. It may still be too high for continuous chronic air levels, but is helpful in evaluating the releases from the site in the short term (*~1-2 years*).

Away from the Roxbury area affected by the landfill, the background hydrogen sulfide levels are typically below 1 ppb.

Average weekly levels recorded by some of the Roxbury monitors had one week averages as low as 2 ppb with some above 10 ppb this past winter.

The nature of the hydrogen sulfide generation process in the landfill is anaerobic digestion by bacteria. This is dependent upon many factors, including the internal temperature of the waste pile. This makes it difficult to predict the fluctuation in levels. We realize that discussions are underway to improve the gas capture and lower the community exposure.

We think that an important short term goal of any remediation effort would be to keep daily average levels below 10 ppb (which happens to correspond to a common olfactory detection threshold). Even though the various irritation and nervous system effects do not occur at such low levels, any level which causes annoyance and symptoms of stress can be considered a health effects level.

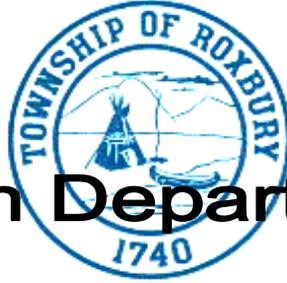
Although 1.4 ppb is not an adverse health level, it is a reasonable goal for the ultimate remediation of the Fenimore Landfill. We re-emphasize that the value should not be construed as a chronic health effects level.

In conclusion: remediation should quickly achieve a background level consistently below 10ppb which would render an odor free environment for most people most of the time.

Ultimately, remediation should allow the residents of Roxbury to share New Jersey's suburban background level of 1 ppb or less.

Your current acute exposure guideline of 100 ppb is reasonable for issuing an alert. The 10ppb value used for issuing an advisory at the ball fields is reasonable, but the 12 ppb value is within the uncertainty of the measurement instrumentation, which makes it an unstable value for issuing a warning about stopping play . We suggest a 15 minute average of 15 ppb as a more reliable value for a warning that stops all athletic activities on a given day.

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## MEMORANDUM

TO: Chris Raths, Township Manager

FROM: Mark Caputo, Health Officer

DATE: March 24, 2014

RE: Rutgers University Toxicologist Report

I reviewed Drs. Gochfeld and Lioy March 21, 2014 memorandum (Toxicologist Report) discussing the applicability of the EPA's chronic exposure level of 1.4 ppb H<sub>2</sub>S and its impact on the community, as well as the memorandum of Joe Eldridge of the NJ Department of Health of the same date. Both memoranda agree that the levels Roxbury has established for Youth Sporting Events at venues near Fenimore, Outdoor School Activities, and General Environmental Standards are based on accurate and recognized ATSDR (Agency for Toxic Substance Disease Registry) research.

To understand the Toxicology Report it is essential to distinguish Acute versus Chronic exposure. Acute exposure means short term exposure, (i.e., an 8 hour period) as opposed to chronic exposure, which is the long term effects of exposure (i.e., over the course of a lifetime or 40 years)

I offer the following bullet points, for better understanding of the Toxicologist Report:

- The Rutgers University Toxicologists agree and re-emphasize 1.4 ppb is not an adverse health level and should not be construed a chronic health effects level.
- The EPA's Reference Concentration (RfC) of 1.4 ppb is a goal by which chronic exposure over a 40+year lifetime should be measured. Statistically, the analogy is to lowering the speed limit on Interstate RT 80 from 55mph to 15 mph to achieve ZERO traffic fatalities.

- The 1.4 ppb is a reference point derived by the EPA from a nasal irritation study in rats exposed to 420 ppb for a 10 week “sub-chronic” duration, then applying an uncertainty factor of 300 times to the final results to account for the uncertain extrapolation if the standard were to be applied to humans.
- The levels Roxbury Township has established for **General Environmental** purposes are satisfactory and are reiterated as follows: 100 ppb for opening the respite center; 510 ppb for the issuance of an alert to utilize the Respite Center; 27,000 ppb to shelter in-place or evacuate to the Respite Center; and 50,000 ppb for immediate mandatory evacuation.
- The levels established for **Youth Sports Fields** in the Fenimore vicinity are also satisfactory and are set as follows: 10 ppb for completing games in progress and then closing the field; and 12ppb for closing the fields immediately.
- The levels established for **Roxbury Schools** are satisfactory and established as follows: 10 ppb for the issuance of a warning and the start of hand held monitoring; and 20 ppb for cancelling outside school activities and requiring students and personnel to remain indoors.
- There is insufficient study in the area of chronic H<sub>2</sub>S exposure in humans to base community wide evacuation. The previously established evacuation standard for acute exposure is reasonable.

Based on the foregoing points and the Toxicologist Report referenced herein, I do not recommend changing the guidance levels previously established.