

## Fenimore Landfill Air Sampling: Evaluation of H<sub>2</sub>S “Spike” Air Sampling Results June 11, 2014

### Background

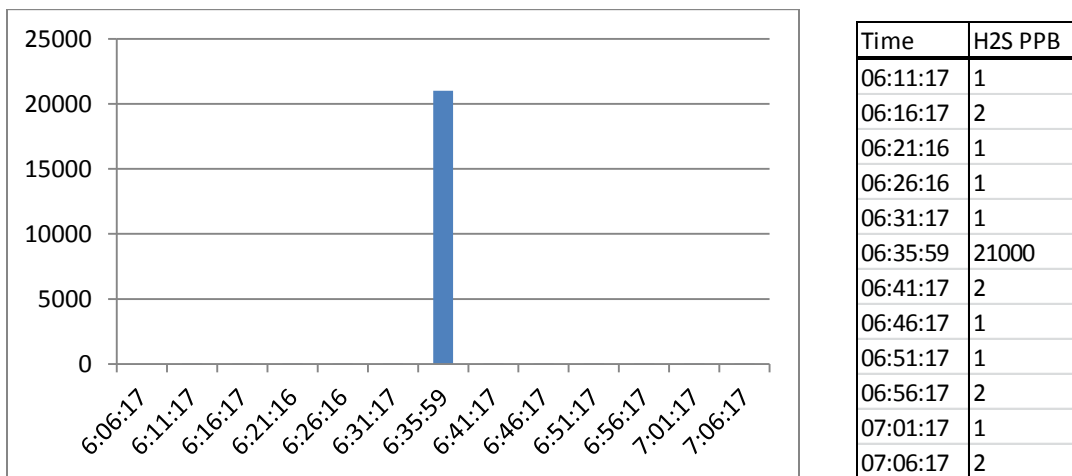
Nine (9) air monitoring stations have Hydrogen Sulfide (H<sub>2</sub>S) meters that are programmed to collect a sample continuously, every 5 minutes. These instruments have been effectively sampling the air quality around the Fenimore landfill for close to one year.

The following paragraphs discuss the issues regarding some isolated spikes that have occurred during this period:

### H<sub>2</sub>S “Spike” Results:

During these past few months we have seen approximately 30 instances when an isolated sample on the H<sub>2</sub>S instrument reports a very high result (hundreds or thousands of parts per billion (ppb)) that is orders-of-magnitude higher than the next sample taken 5 minutes before and 5 minutes after the initial sample. Below is an example (Chart #1) of such a spike that occurred early morning on 2/05/2014 with an increase of 4 orders of magnitude or 10,000 times greater than the corresponding results before and after the spike result.

**Chart #1 – Rox 8 2/05/2013**



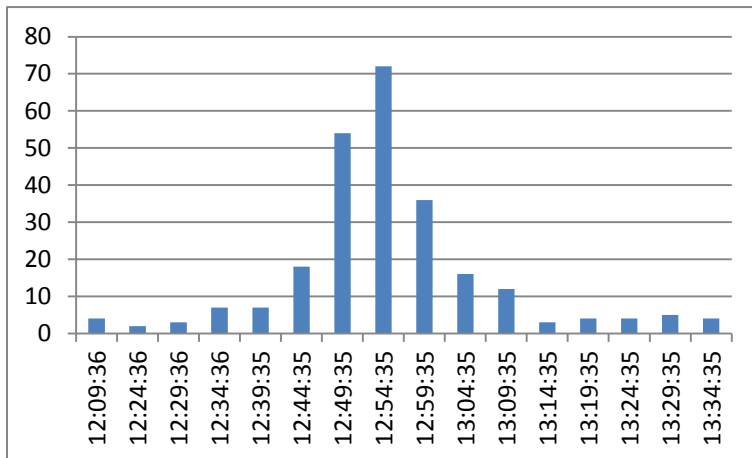
After reviewing this data, it seems evident that these isolated spikes are either from some surge or artifact in the instrument electronics creating a one-time high, but false, reading. A second cause may be that these air monitoring stations are measuring some type of short-lived, very transient gaseous

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interference produced in the immediate area adjacent to these stations. Whether the cause is an electronic error or “blast” from some transient gaseous contaminant, it is our opinion that these very high, one time readings do not represent true readings of landfill gas coming from the Fenimore landfill. As such, we would propose, going forward, to classify these errant readings as *temporary invalid readings* which would not be used in the real-time monitoring reporting system to trigger notifications of an exceedence related to landfill emissions coming from the Fenimore landfill.

Another very important point is that these spike readings do not follow the data pattern we have seen when measuring actual landfill emissions over the past year. As an example, below is a typical group of sampling results (Chart #2) documenting a landfill gas emission that occurred for a short period of time on 2/13/2014. These series of results show steadily increasing and decreasing readings over a 45 minute period which correlates well to the pattern of real-time readings when actually measuring landfill gas.

**Chart # 2 - Rox 8 02/13/2014 – Readings when Landfill Scrubber shut down for short period**



Time	H2S PPB
12:09:36	4
12:24:36	2
12:29:36	3
12:34:36	7
12:39:35	7
12:44:35	18
12:49:35	54
12:54:35	72
12:59:35	36
13:04:35	16
13:09:35	12
13:14:35	3
13:19:35	4
13:24:35	4
13:29:35	5
13:34:35	4

This issue of errant spikes was discussed with the Air Quality group at NJDEP who operate the air pollution monitoring stations throughout the state. This is the same group that is operating the three SO<sub>2</sub> air monitoring stations at the Fenimore landfill. It is their experience that real-time data from air monitoring instruments that run constantly can occasionally produce results that are not considered valid or real. These are very accurate, precise and sensitive laboratory grade instruments that can run reliably and accurately for extensive periods of time. However, experience has shown that these instruments may occasionally and very infrequently produce an errant result that does not make scientific sense or may be caused by an interference that is not related to what the instrument is

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targeted to sample. The air monitoring systems at Fenimore is principally targeted to measure emissions coming from the landfill itself.

At the Fenimore air monitoring stations we are seeing these errant spikes, this winter, at a frequency of about 1 in every 10,000 samples. This, according to our experience as well as that of the NJDEP, is not an error frequency that would be considered unexpected or unusual for these types of field instruments operating in a wide variety of weather conditions. It is also not indicative of the fact that these instruments are not operating effectively or reliably.

When evaluating individual, real-time air monitoring results that are considered highly suspicious or outliers, the NJDEP Quality Assurance procedure is to classify these data points as either: 1- improbable but possible, or 2- impossible. These questionable results are immediately and temporarily tagged by the NJDEP as an invalid data point and removed from the real-time reporting data set. Temporary invalid data points are not erased but are placed in a separate table for a more formal review. The review is conducted to classify it permanently as either valid or invalid data. Invalid data is not used to calculate airborne concentrations or to trigger exceedances or thresholds. After the review, the invalid instrument readings are not erased but are stored separately in another database listing all data that has been classified as permanently invalid.

It is also likely that some of these spike readings maybe caused by some gaseous interference that is short lived and transient and creates a high reading on the H<sub>2</sub>S monitors. One type of emission source, identified as a common interference by the instrument manufacturer, is diesel exhaust. Diesel trucks, construction equipment and other equipment have been reported by the EPA as producing hydrogen sulfide gas in their exhaust. The concentration of hydrogen sulfide, as well as other gaseous contaminants, in the exhaust stream of a diesel engine can be quite high. The instrument manufacturer has reported that if the H<sub>2</sub>S detector gets a “direct hit” from the exhaust stream of a diesel powered engine, the measured result may also be quite high often approaching concentrations of hundreds or thousands of ppb in air. Diesel exhaust generally dissipates quickly in the ambient air and gets efficiently diluted even when there is minimal air flow. This is evidenced by the corresponding low results measured 5 minutes after the high “spike” reading occurred.

We have measured the diesel exhaust stream with Jerome 631X monitoring instruments and have been able to reproduce these high spike readings ranging from 350-450ppb 10 feet away from the exhaust pipe. It is not known if these high results are measuring hydrogen sulfide gas, other gaseous interferences or are impacted by the rapid increase in temperature from the heated exhaust. Our theory is it probably is related to a combination of all three. Therefore, it seems reasonable to conclude that some or all of these isolated spikes may be related to diesel exhaust interferences from trucks and other equipment that is running by these stations. This is especially true for those stations that are located next to or near roadways and parking lots which account for many of the stations that had these “spike” readings.

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One spike reading at or above 100 ppb will be high enough to trigger a 15 minute time-weighted-average alert or warning notification. These alerts and notifications were established originally to take action if relatively high concentrations of landfill gas emissions are detected and sustained by the air sampling stations. It is our and NJDEP’s opinion that these spikes, as we defined above, are not related to Fenimore landfill emissions. Therefore these spikes are considered to be false positive results and should not be broadcasted as a valid result triggering an alert or notification to the public. They should, however, be tagged for evaluation by the Emilcott and/or NJDEP air sampling Quality Assurance scientists to determine if they should be classified as either a permanent invalid result or reclassified as a valid result that would be included as part of the air sampling data base.

**Proposed Action for Managing these Spike Results:**

The Emilcott Quality Assurance Plan will be updated to evaluate air sampling results to identify possible “spike” results. A spike result will be defined as one reading which is 50+ times greater than the average of the reading taken just before and after the spike result. As an example, in calculating the results in table # 1, the average results of sample # 2 and 4 is 4ppb. The result of sample #3 is 500ppb which is 125 times greater than the average result of sample # 2&4. This would tag this result as a spike and therefore be automatically classified as data that is temporarily invalid. The spike result will register as an N/A result in the real-time reporting of live data and will not be used to calculate a 15 or 60 minute time weighted average air concentration in determining if notifications or alerts should be sent. The spike result will be evaluated by the Emilcott air sampling Quality Assurance scientist and classified as either permanently invalid or reclassified as valid. The data will be included in the weekly reports as either part of the air sampling database if it was determined the result was valid, or on the invalid result database with an explanation of the determination.

#	PPB
1	3
2	4
3	500
4	4
5	4