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BOBBY B. LYLE SCHOOL OF ENGINEERING

*Department of Environmental and Civil Engineering*

August 7, 2009

Dear Ms. Rogers,

It was a pleasure talking to you about your concerns over air quality at your home and business. I have reviewed the analytical results that were obtained by the engineering firm that conducted air quality sampling on your property on May 25, 2009.

The results from air quality sampling at a residence or other public space are appropriately compared to standards developed by federal agencies such as the EPA, or state agencies such as the TCEQ. Because the sampling performed on May 25, 2009, was during a short-period of time (as opposed to year-long, or multi-year long sampling), it is most appropriate to compare the results obtained on your property to the "short-term" environmental standards.

After reviewing the results obtained on your property on May 25, 2009, I believe that there is a legitimate cause for concern. According to the 2/13/2009 Effect Screening Levels published by the TCEQ (<http://www.tceq.state.tx.us/assets/public/implementation/tox/esl/list/pdf.pdf>), the TCEQ Short-Term safe level for carbon disulfide is 10 ppb. The results of the sampling on your property indicated levels approximately 50% higher than the ESL, 14.7 ppb from one canister and 15.1 ppb from a second.

EPA has summarized a large body of information about different air pollutants in their "Health Effects Notebook for Hazardous Air Pollutants." EPA concerns about carbon disulfide include potential symptoms such as : "Nausea, vomiting, dizziness, fatigue, headache, mood changes, lethargy, blurred vision, delirium, and convulsions have also been reported in humans acutely exposed by inhalation. " It appears that most of the medical literature about carbon disulfide exposure is derived from industrial workers who are likely exposed to much higher levels than were identified on your property. Nonetheless, it appears highly unusual to find anywhere near the levels of carbon disulfide that were found in your residential area. In their Health Effects Notebook, EPA states, "Concentrations of carbon disulfide in urban/suburban areas were measured at about 65 parts per trillion (ppt) and in rural areas at about 41 ppt." The levels in the air at your property were approximately 300 times higher than the levels that are normally present in residential, suburban, or rural settings. The results from the sampling on your property are highly suggestive that at the time of the sampling, a source of carbon disulfide was putting sufficient quantities of this chemical in the air to greatly elevate the concentration of carbon disulfide, to a concentration greatly above the normal urban/suburban/rural levels identified by EPA and above the Short-Term ESL established by TCEQ.

In addition, EPA has an interesting note about the toxicity of carbon disulfide, "Tests involving acute exposure of rats, mice, and rabbits have shown carbon disulfide to have low acute toxicity from inhalation and moderate acute toxicity by ingestion." Given the food manufacturing (dairy) business that you operate at your property, the enhanced toxicity of carbon disulfide via ingestion might be a concern to grazing animals or to people who accidentally ingest soils or other material that have been contaminated by carbon disulfide.

Carbon disulfide (and other disulfide compounds identified in your report) are not chemicals typically associated with motor vehicles exhausts, household cleaning products, or typical residential businesses like dry cleaners, auto repair garages, or restaurants. Carbon disulfide is used in the industrial manufacturing of rayon, but I am unaware of industrial rayon manufacturing anywhere in North Texas. Carbon disulfide and other reduced sulfur compounds are found geologically in oil and gas formations, and they can be released to the atmosphere during oil and gas production, transportation, processing, and refining.

Outside of the concern from direct health risks, the level of carbon disulfide at 15 ppb, together with the levels of the many other reduced sulfur compounds that were identified by the sampling on your property (which ranged from 8 to 80 ppb) suggests a potential problem with odors. Carbon disulfide, dimethyl disulfide, and similar compounds have a highly unpleasant odor and the human olfactory system is extremely sensitive to ppb and even high ppt levels of these kinds of compounds. While scent and odor sensitivity can vary from person to person, levels of multiple reduced sulfur compounds in the 1-100 ppb range could result in a general nuisance or otherwise diminish the overall quality of life in an area.

Finally, I have examined meteorological data for the morning, mid-day, and afternoon of May 25, 2009. I obtained data from 4 stations in the Fort Worth area that report to the National Climate Data Center. On this day, winds were very low, with nearly all hours having mean winds below 10 mph, many hours below 5 mph, and many hours with calm winds (<1 mph). For calm and extremely low winds, the direction of winds is very hard to determine, especially at the neighborhood level. In fact, it is generally recognized that on a day like May 25, 2009 with winds below 5 mph and 1 mph for many hours, emissions can stagnate and move in any/all directions (i.e. spread) in any given hour. The unusually high levels of the disulfide compounds on your property that were greatly above what EPA considers to be the normal residential background, together with the low wind speeds observed in the Fort Worth area, and the lack of other potential sources, suggests that oil/gas activities at a location near your property may have been the source of the disulfide compounds in the air on May 25, 2009.

I would suggest contacting the Fort Worth district office of the TCEQ and the Dallas regional office of the EPA to show them the data you acquired and discuss your concerns.

Please give me a call if you have any questions.

Sincerely,

A handwritten signature in blue ink that reads "Al Armendariz". The signature is written in a cursive style with a large initial "A" and a long, sweeping underline.

Al Armendariz, Ph.D.