GERAGHTY & MILLER, INC.
Environmental Services

Ground Water *Engineering* *Hydrocarbon* *Remediation* *Education*

March 22, 1994

Caroline Kwan
U.S. Environmental Protection Agency
Region II
26 Federal Plaza, Room 737
New York, New York 10278

Re: Soil Gas Survey Report for the Curriculum Center and Virgin Islands Housing Authority, Tutu Wells Site, St. Thomas, U.S. Virgin Islands.

Dear Ms. Kwan:

In accordance with the Phase II Remedial Investigation (RI) Work Plan, Tutu Wells Site, St. Thomas, U.S. Virgin Islands (Geraghty & Miller, Inc. 1993a), Geraghty & Miller, Inc., on behalf of the Tutu Environmental Investigation Committee (TEIC), conducted a soil gas survey at the Curriculum Center (former Laga Building) and the Virgin Island Housing Authority (VIHA) properties from February 28 through March 10, 1994. As stated in the work plan, the purpose of the soil gas survey was primarily to provide a screening tool to optimize the locations of proposed new monitoring wells, and to provide a preliminary indication of the potential contaminant source areas. The final location of two shallow new proposed Monitoring Wells, (MW-16 at the Curriculum Center and MW-13 at VIHA) are to be selected after analyzing the results of the soil gas survey. This letter report presents the methodology and results of the soil gas surveys.

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METHODOLOGY

A Photovac 10S50 portable gas chromatograph (GC) was used to analyze the vapor samples collected at the site. The Photovac 10S50 portable GC is equipped with a photoionization detector (PID) and a CPSil-5 capillary column. The oven temperature was set at 40° Celsius (C). Based on previous data collected at the site, the GC was calibrated with the following compounds: trans-1,2-dichloroethene (trans-1,2-DCE); cis-1,2-dichloroethene (cis-1,2-DCE); benzene; trichloroethene (TCE); toluene; tetrachloroethene (also known as perchloroethene and abbreviated as PCE); meta-xylene; and ortho-xylene. An unbiased 40-foot grid was laid out over the Curriculum Center property and the VIHA property. Some soil gas points were relocated if buildings or concrete pavement presented obstructions. Soil gas survey points were located at each node of the grid. In areas where greater resolution was needed to identify possible contaminant source areas, a 20-foot spacing was employed until the areas of concern were delineated. Soil gas survey sample points were numbered SGC-1 through SGC-46 at the Curriculum Center and SGH-1 through SGH-26 at VIHA, as shown on Figures 1 and 2, respectively.

Even though the column temperature is constant, due to the lack of a heated injection port, the temperature of the injection port and the lines leading to the column changes throughout the day, which changes the retention time of the compounds. Therefore, Geraghty & Miller relies on the chemist, rather than the GC, to identify all compounds. Also, due to software limitations, an internal calibration is based on only one injection. Geraghty & Miller's external calibration is derived from an average of 5 injections which is more accurate. The internal GC library was not used for these reasons; therefore, all peaks were identified by the GC as unknowns.

CALIBRATION

An air standard was prepared by withdrawing headspace gas from pure stocks of each selected compound using a gas-tight syringe and injection into a 1-liter Tedlar bag previously

filled with ultra zero air. The concentration of the compounds in the standard were 2 parts per million by volume (ppmv) of trans-1,2-DCE and cis-1,2-DCE and 5 ppmv for benzene, TCE, toluene, PCE, meta-xylene, and ortho-xylene. This standard was prepared daily. Each morning, the standard was injected into the GC five times. A response factor was calculated for each compound by dividing the standard concentration by the average peak area from the five injections. Detection limits were calculated daily based on instrument response.

QUALITY CONTROL

Standards were analyzed at a minimum of once every 4 hours and at the end of each day to check for retention time drift. Syringe blanks were analyzed after all standardizations, and equipment blanks were analyzed after running each sample that contained volatile organic compound (VOC) peaks with areas greater than 0.3 millivolt seconds (mv/s). The analysis of syringe blanks and equipment blanks prevents carryover of compounds from one run to the next run. Duplicate sample analyses were conducted every ten samples. Steel rods were rinsed with Micro liquid detergent and distilled water between soil gas points. After each soil gas point where VOCs were detected, probe blanks were analyzed. The probe tube was not reused unless the blank contained no peaks with areas greater than 0.3 mv/s.

SAMPLING PROCEDURE

A 1 1/2-inch diameter borehole was created in the soil with a slide hammer and solid rod assembly. The depths of the boreholes were approximately 1.5 to 3 feet below land surface. The solid rod was removed and a hollow 1/4-inch diameter stainless steel pipe was inserted with a 1/8-inch Teflon tube contained inside. The Teflon tubing extended above the hollow stainless steel tube; midway down the exposed Teflon tubing was a stainless steel tee through which syringe samples were collected. A nail inserted into the end of the Teflon tubing prevented clogging of the assembly as it was lowered into the borehole. The nail was then disengaged, and the top of the borehole was sealed around the stainless steel pipe with modeling clay. The clay used is reported to be non-toxic and safe for children. A sample of the clay was heated for

15 minutes in a VOC vial and the headspace analyzed; no VOCs were detected. The Teflon tubing was attached to a diaphragm pump and the borehole was evacuated.

A purging test was performed to determine the correct evacuation time. During the purging test, samples were collected from the stainless steel tee using a gas-tight syringe at 1-minute intervals for 5 minutes. No peaks appeared on the chromatogram of samples collected from Soil Gas Point SGC-1. The study done at Soil Gas Point SGC-3 indicated that all five samples collected during the study had approximately the same concentrations. Therefore, a purging time of 2 minutes was used for all further sampling. The technique used to collect soil gas samples is consistent with that described by Dr. Thomas Spittler, USEPA Region I Lab Director, in his course on soil gas sampling and analysis. The purging time study is designed to indicate at what purging time the area surrounding the probe has its maximum concentration of total VOCs. If the hole was overpumped, the study would show a decreasing concentration of VOCs over time. This recommended purging time study and has proven to be practical and useful at many sites.

RESULTS AND INTERPRETATION

The soil gas survey results are presented in this section.

CURRICULUM CENTER

The soil gas sample results for the Curriculum Center are provided in Table 1. Chromatograms for the analyses are included in Appendix A; soil gas sample locations are shown on Figure 1. Soil descriptions for the Curriculum Center from Geraghty & Miller soil boring and monitoring well logs indicated the presence of silty clay (saprolite) varying in thickness from 1.8 feet (at Monitoring Well MW-1) to 10.3 feet (at Soil Boring B-1). Fill placement in the northwest corner of the property has created the thickest soil cover (near Soil Boring B-1). All other boring logs, for locations north and west of the Curriculum Center,

indicate soil thicknesses equal to or less than 3.7 feet. The soil horizon lies directly over bedrock

PCE was detected at 32 locations, at concentrations ranging from 0.06 ppmv (Soil Gas Point SGC-13) to 140 ppmv (Soil Gas Point SGC-43). TCE was detected at eleven locations, at concentrations ranging from 0.03 ppmv (Soil Gas Point SGC-30) to 30 ppmv (Soil Gas Point SGC-43). Cis-1,2-DCE was detected at eight locations, at concentrations ranging from 0.1 ppmv (Soil Gas Point SGC-3) to 5 ppmv (Soil Gas Point SGC-29). Trans-1,2-DCE was detected at six locations at concentrations ranging from 0.04 ppmv (Soil Gas Points SGC-24 and SGC-35) to 0.4 ppmv (SGC-43).

Toluene was detected at only one location (Soil Gas Point SGC-37), at a concentration of 0.02 ppmv. Benzene, meta-xylene and ortho-xylene were not detected at any soil sampling locations.

The highest concentrations of chlorinated VOCs in soil gas were detected north of the Curriculum Center Building, centered around Soil Gas Point SGC-43 (estimated concentration of approximately 174 ppmv). An area approximately 150 feet long (in an east-west direction) and 90 feet wide (north-south) showed total chlorinated VOCs greater than 1 ppmv (see Figure 1).

Two other areas of elevated concentrations of chlorinated VOCs (above 1 ppmv total chlorinated VOCs) were identified at the Curriculum Center. One area is centered at Soil-Gas Point SGC-14 (estimated concentration of 30.1 ppmv). The other area, centered at Soil-Gas Point SGC-04, showed concentrations between 1.0 and 5.0 ppmv. An isolated concentration of 3 ppmv total VOCs was detected at Soil-Gas Survey Point SGC-25.

VIRGIN ISLANDS HOUSING AUTHORITY

The soil gas survey results for the VIHA property are provided in Table 2. Chromatograms for the analyses are included in Appendix A. Soil gas sample locations are shown on Figure 2. Twenty-six soil gas locations were sampled. VOCs were not detected in any of the soil gas samples collected at the Virgin Islands Housing Authority. According to Ms. Ralda Simmonds, Esq. (VIHA Attorney), an underground storage tank (UST) is located at the southwest corner of the canopy along the west side of the VIHA maintenance building (see Figure 2).

RECOMMENDATIONS

- Based on the results of the soil gas survey conducted at the Curriculum Center, Geraghty & Miller recommends that proposed shallow Monitoring Well MW-16 be installed at the location of Soil Gas Point SGC-29 (grid coordinates N0340, E0260). The highest concentrations of chlorinated compounds (estimated value of 174.04 ppmv) were detected 30 feet Northeast (upgradient) of this location. The soil sample from this boring with the highest photoionization detector (PID) reading should be collected and analyzed for the Target Compound List (TCL) VOCs. An underground water supply line is located near this location. If this water line interferes with the proposed location for Monitoring Well MW-16, the well will be located downgradient (i.e., southwest), as close as possible to the proposed location.

- Since no VOCs were detected in soil gas samples collected at VIHA, proposed shallow Monitoring Well MW-13 should be located within 10 feet of the existing deep Monitoring Well MW-13D; this will form a well pair to provide comparison of shallow and deep groundwater elevations and groundwater quality.

In Geraghty & Miller's Phase II RI proposed Work Plan, the proposed monitoring well at the Curriculum Center was called MW-13 and the monitoring well at VIHA was called MW-16. These designations have been reversed to be consistent with existing deep Monitoring Well MW-13D at VIHA.

Geraghty & Miller, on behalf of the TEIC, would like to request that the USEPA respond promptly to the proposed locations for Monitoring Wells MW-13 and MW-16, so the drilling program can be scheduled accordingly.

Sincerely,

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