The AquAeTerian

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Aqua Aer Terra

In This Issue:

Next Issue:

The Status of Radioactive Waste Disposal in the U.S.

Environmental Issues in the Mining Industry

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The President's Corner

***Qualitas aeris*: Air Quality**

The **AquAeTerians** have been extremely busy this year and growing in numbers. In this issue of our newsletter, we are featuring articles on ambient air monitoring projects at two southeastern sites and a groundwater monitoring investigation in the remote location of Adak Island, Alaska.

I am pleased to announce that Dr. Jim Clarke, Technical Director of Environmental Forensics at **AquAeTer**, has been appointed by the Nuclear Regulatory Commission to its Advisory Committee on Nuclear Waste (ACNW). The ACNW provides independent technical advice on activities, programs, and issues associated with regulating, managing, and disposing of radioactive waste. Jim is one of five members on this prestigious and important committee for overseeing nuclear waste issues in the U.S. Jim is also a Professor of the Practice of Civil and Environmental Engineering and the Director of Graduate Studies for Environmental Engineering at Vanderbilt University.

I would also like to congratulate Chrisie Brown who recently recieved her Tennesse P.E. **AquAeTer** continues to grow and we have recently added additional technical, administrative, and financial staff to our team including in our Brentwood office: Darci Scherbak, P.E., Environmental Engineer specializing in hazardous waste management and remediation; Mary Ann Emmons, Environmental Chemist and Radiochemist, specializing in risk assessment and environmental forensics; Tyler Smith, Administrative Assistant; and Chelsea Cunningham, Accounting Assistant. In our Centennial office, we have added Adam Musulin, E.I.T., Chemical Engineer, specializing in water quality, groundwater, soils and soil vapor monitoring at landfills and other industrial sites; Sean Muller, P.G., a consulting geologist with over 30 years with extensive experience in mineral and petroleum exploration, as well as, development, permitting and environmental compliance for mining companies and other industrial clients. His specialties include geochemistry, aquifer restoration, and environmental impact mitigation. Additionally, Dr. Ram Ramaswami, P.E., DEE has joined the Centennial office and will be concentrating in wastewater engineering and in-situ remediation. Ram is an Adjunct Professor in the Department of Civil Engineering at the University of Colorado-Denver.

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Initial Calibrations

This particular project produced some very interesting results which demonstrated that the suspected industrial emissions were not the only or even primary source impacting ambient air quality. The VOC portion of the test was run at two separate times approximatley one year apart. The concentrations of benzene, one of the potential VOCs of concern from the industrial site, were consistently higher at the background stations than from the industrial source. Some of the background results were actually above the USEPA screening levels. The elevated benzene levels were primarily due to local traffic patterns and not the industrial facility, as shown in Table 1. One of the background sampling stations was located near a school. The ambient benzene concentrations measured during the second event were higher compared to those measured during the first event. These results are explained by the fact that the second sampling event occurred with school in session and the first event occurred during summer vacation. The reduction in vehicle traffic in the summer was clearly indicated by the sampling results.

The results for naphthalene, also shown in Table 1, followed similar trends, particularly around interstates and shopping malls. One sampling location was heavily influenced by the activities of the operation of a vacuum truck that was conducting routine sewer work.

In summary, ambient air data can provide enlightening information concerning the true sources impacting the ambient air quality around us. However, there are several critical components that must be developed and coordinated effectively in order to obtain reliable and relevant data. **AquAeTer** has the team in place to meet this challenge.

Table 1. Ambient Air Concentrations for Benzene and Naphthalene from Anthropogenic Sources

LOCATION	AVERAGE AIR CONCENTRATION MEASUREMENTS (ug/m^3)	OSHA 8-HR TWA (ug/m^3)	USEPA RISK-BASED SCREENING LEVEL (ug/m^3)	COMMENTS Note: USEPA Method TO-14A
	Benzene			
School - Summer	0.50	3,190	0.23	No School
School - Spring	1.05	3,190	0.23	School in Session - automobile and bus traffic
Reference Stations	1.39	3,190	0.23	Shopping Center/Roads
	Naphthalene			
Diesel Vacuum Truck	21.76	52,400	3.1	Truck running 8 hrs out of 24 hr sample period
Reference Stations	5.24	52,400	3.1	Shopping Center/Roads

$$0.115\ ppb_v * 78 / 24.45 = 0.37\ \mu g/m^3$$

Measuring Ambient Air Quality in Urban/Industrial Environments

Most industrial and urban activities generate airborne emissions during the normal course of operations. Quantifying the levels of these emissions in the ambient air given the complexities of a typical mix of urban/manufacturing environment can be challenging for many reasons. Ambient air sampling generally involves collecting low concentrations of specific constituents, which requires exposing media to the air for an extended period of time. Sampling requires specialized methods and equipment, and the process requires rigorous quality control and documentation throughout. **AquAeTer** has proven in-house expertise to design and implement air monitoring programs for sampling various compounds of interest in ambient air. The data generated can be used as a basis for analysis to assist in determining the impacts of industrial releases to surrounding communities. These analyses may include ambient air concentrations, fate and effects determinations, dispersion modeling, and risk assessments. A typical project involves a client retaining **AquAeTer** to identify the applicable sampling and analytical methods (State or USEPA), designing a sampling network, developing and implementing a work plan, overseeing and validating data quality, and reporting results in a concise and understandable format.

In a recent sampling event, **AquAeTer** developed and implemented a sampling plan that required seven professionals of varying backgrounds including meteorological science, chemistry, environmental science and other engineering disciplines. The event required around-the-clock coverage that simultaneously deployed five different approved sampling and analytical methods over a three-day period. The study quantified ambient concentrations of several complex compounds including polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), metals, phenolics, and dioxins and furans.

Several days of preparation and setup were required prior to the actual sampling event. The first team of two individuals arrived in advance to complete a detailed reconnaissance of the sampling area for final sampling site selection. Sampling location determination took into account power availability, proximity to the emission source, and security of the sampling equipment and sample crews. Since the meteorological conditions are also an important factor in understanding transport of constituents in ambient air, the first team also established a local weather data recording station. Sampling equipment and media were received from suppliers and organized in the field office. Three days into the preparation phase, two additional team members arrived. The next two days involved the physical set-up and field testing of the sample equipment. This included making all of the necessary mechanical and electrical connections followed by air flow calibration and media preparation. Each high


Preparation of High-Volume Samplers

and low-flow rate sampler was calibrated prior to the test and at the test's conclusion. This project required 16 high-volume air samplers for PAHs, metals, and dioxins/furans; over 40 negative-pressure sample vessels for VOCs; and over 30 low-volume air sampling pumps for phenolics. All of the sampling media cartridges were prepared along with duplicates, blanks, and spiked samples for laboratory and field quality control purposes. Three remaining team members arrived one day prior to sampling. They double checked all of the preparations, made necessary adjustments, and recorded the location of each sample location with a Global Position System (GPS) device. The team was now prepared to begin the sampling event.


Top of High-Volume Sampler Station

The sampling event was initiated early the following day and proceeded on a round-the-clock basis for the next three days. Activities consisted of visits every four hours to each sampling station for data recording, air flow adjustments, sample media exchange, and shipment to the laboratory.


Low-Volume Samplers

$$0.115\ ppb_v * 78 / 24.45 = 0.37\ \mu g/m^3$$

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Groundwater Sampling in Adak, Alaska

Since 2002, **AquAeTer** has performed groundwater sampling at the former Naval Air Complex (NAC), located on Adak Island, Alaska on the Aleutian Island chain. This work is performed in conjuction with Clarus Technologies LLC, a subsidiary of Koniag, Inc., an Alaska Native regional corporation.

The site is in long-term monitoring status under a Navy, USEPA, and State of Alaska Department of Environmental Conservation (ADEC) agreement that requires a comprehensive monitoring plan. The site, primarily used by the military from 1942 to 1997, contains closed landfills, solid waste management units, former underground storage tank locations, steam plants, heating plants, hangars, and locations of former leaks of aviation fuel and heating fuel. Our task was to collect environmental samples for petroleum hydrocarbons, volatile organic compounds, metals, pesticides, and PCBs. Data were also collected on the natural attenuation indicator parameters including groundwater alkalinity, sulfate, and dissolved methane. *In-situ* measurements were made for free product, dissolved oxygen, pH, and oxidation-reduction potential. During a six-week period in 2002, sampling was conducted at over 100 groundwater well, surface water, and soil locations.

The most challenging aspect of this project was related to the remote location. For example, with only two weekly flights in 2004 and limited availability of food and other essential supplies on-island, careful planning was required to assemble field equipment and other supplies for mobilization to Adak via air cargo. Extra planning was also required to prepare the environmental samples for shipping by air to the analytical laboratories within the 48-hour holding times required.

Other challenges included foul weather conditions, nearly constant high winds, frequent rain, damaged or missing wells, occasional power outages, limited phone and internet connections, and finite daylight hours. Additionally, certain parts of the island contain potentially dangerous relics from occupancy during World War II through the Cold War, such as, unexploded ordnance and hidden rommel stakes in the tundra.

In contrast to the rugged conditions, the unique Adak environment offered vividly colorful and complete rainbows, ephemeral low-angle sunlight gleaming across brown tundra and green beach grasses, unpopulated stretches of windswept sandy and rocky beaches, and walking and hiking trails. Local wildlife included caribou, ravens, juvenile bald eagles, sea lions, sea otters, salmon, halibut, and crab.

In 2004, I had the pleasure of managing a team of six, including two **AquAeTerians** and three others associated with Clarus. After 3 ½ weeks, we successfully completed the 2004 sampling on time and to the Navy's and Clarus' satisfaction. Those who had the unique opportunity to participate in this groundwater sampling adventure said it was the experience of a lifetime and are already volunteering for the next sampling event.