

FLOODWATER IMPACT ASSESSMENT “CSI: CONTAMINATED SCENE INVESTIGATION”

Chelsea Group offers its floodwater Contamination Scene Investigation (CSI) program to use the right combination of sampling and analytical techniques to determine the source of water intrusion in a building.

BACKGROUND

Hurricane Katrina has come to signify the most recent wrath of Mother Nature in the United States. The Category 4 hurricane brought with it heavy winds and rain to Southeast Louisiana. This resulted in the breaching of several levees and flooding of up to 80% of New Orleans and surrounding parishes. Many of these areas were then re-flooded by storm surge of Hurricane Rita.

As buildings are slowly being restored and re-occupied, many questions are being asked about the environmental contamination resulting from the hurricanes. To many, a top-of-mind question is whether the building's insurance was sufficient to cover the cost of assessing these environmental impacts and the restoration activities required to return the building to re-occupancy acceptability.



According to The Federal Emergency Management Agency, insurance claims for Hurricane Katrina alone amounted to about \$23 billion and reconstruction costs are estimated to be at least \$200 billion, making Katrina the most costly hurricane in history.

WHO PAYS: TECHNOLOGY SUPPORTS BUSINESS

An urgent question in many of the water damage claims resultant of the Hurricane Katrina events was, “Where did the water come from?” Most businesses and residences did not carry flood insurance coverage. Therefore, it may be necessary to document that water damage was caused by the wind and rain, rather than floodwater, to receive insurance compensation for the clean-up.

Chelsea Group provided documentation that damage to the Contemporary Arts Center in the historic arts district of New Orleans in October 2005 resulted from rain water intrusion. Water samples were collected in the basement of the Arts Center to determine whether bacteria indicative of wastewater contamination were present by culturing techniques. By determining the cause of the water damage, Chelsea Group proved that the building merited insurance funding, which would not have been available if the damage was the result of flooding rather than wind and rain.



Many facilities are just now starting to consider rebuilding and the cost to do so, months after the flooding events. To make matters worse, New Orleans has experienced one of the driest winters after the flood occurred. In most cases the buildings are now dry and the water that kept bacteria viable is gone. Simple tests that would have proven the source of the water no longer are an option. Therefore, it is necessary to turn to other sampling and analytical methods to pinpoint the source of the water.

VIABLE BACTERIAL SAMPLING

If water or wet material is still present, sampling for viable bacteria is the simplest and most cost-effective way of determining presence of floodwater. As the floodwater commingled with sewage collection system waters, looking for the presence of specific bacteria from fecal contamination by culturing means is essential. Fecal bacteria, such as *Escherichia coli*, *Enterococcus spp.*, and *Enterobacter spp.*, live in the intestines of humans and warm- and cold-blooded animals, and aid in the digestion of nutrients. These bacteria are not normally considered harmful themselves, but can indicate the presence of other more pathogenic organisms associated with water contaminated by fecal material of man or other animals. Initial results of floodwater quality tests in New Orleans revealed fecal bacteria in excess of 100 times that of EPA's safe swimming limits. Rainwater will not contain significant amounts of these bacteria.

NON-VIABLE BACTERIA SAMPLING

Unfortunately, fecal bacteria cannot survive long without a host or a water source. Even if water is still present in hurricane-ravaged buildings, the probability of the presence of these bacteria as living organisms is very limited. However, it can be expected that their remnants may still linger in buildings that have not yet been cleaned. These remnants can be used to determine whether water damaged material was exposed to floodwaters.

Methods to test for the DNA "fingerprints" of these fecal bacteria are available from select laboratories. Polymerase chain reaction (PCR) is a process of amplifying a small amount of specific DNA collected on a sample. DNA libraries are available for *E.Coli* and *Enterobacter* and *Enterococci*. Although much more expensive than culturing methods, the DNA method does not require the organism to be alive, just that its DNA is present.

BACTERIAL BY-PRODUCT SAMPLING

Another method for testing for remnants of fecal bacteria is through chemical means. Fecal sterols are the by-product of the breakdown of cholesterol by intestinal bacteria. Government agencies have proposed that the fecal sterol, coprostanol, a compound specific to human sanitary waste, is a more reliable indicator of sewage contamination than the traditional microbiological methods. Other common fecal sterols are epicoprostanol, cholestanol, and epichoestanol. Again, this method is more expensive than traditional microbiological culture methods, and is relatively new to the fecal contamination analysis arena. How quickly these chemicals are further broken down by environmental bacteria is a main question regarding the usefulness of this method. Fecal sterols are one more method of determining whether water damaged material was exposed to floodwaters.



CHEMICAL SAMPLING

In addition to the microbiological contamination, floodwater carried with it a “chemical soup” of contamination. Storage containers of chemicals, toxic land sites, and oil refineries were submerged. This resulted in the release of about 200 chemicals including volatile organic compounds (VOCs), metals, pesticides, polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), and petroleum hydrocarbons into the floodwaters. A few trace chemicals from this soup would likely leave a residue at the scum line of a water-damaged building. Using a combination of chemical analysis of this residue as a chemical fingerprint may help determine the source of the water. A combination of these chemicals would unlikely be present in high concentrations unless the waters were from the flooding. However it is important to note that several of these chemicals are often found in non-flooded buildings.

CHELSEA METHODOLOGY

Chelsea Group has evaluated the various floodwater CSI techniques and their optimal application. By selecting a site-specific mix of biological, genetic, and chemical tests, Chelsea Group can develop compelling evidence of the source of water in a building. Proof of the presence of floodwater is easier than proof of its absence. Proof of rainwater is complex because it does not have the trace chemical or biological indicators as floodwaters do. Chelsea Group's experts have refined the CSI procedure to bring scientific information to the evaluation of the water source.