

Environmental Science, Engineering, and Forensic Investigations



“The significant problems in life cannot be solved at the same level of thinking we were at when we created them.”

Albert Einstein

3TM CONSULTING, LLC

Who We Are

In 1995, 3TM Consulting began its first project in the field of environmental forensics. Two years later, our client was successful in settling a lawsuit for \$55 million.

Since that time, 3TM Consulting has supported both defendants and plaintiffs in the legal arena. Our clients include industrial and commercial companies, governmental agencies, attorneys, land owners and realtors, toxicologists and medical doctors, and other consultants.

3TM Consulting routinely provides consulting support to its clients in the area of environmental science and engineering. Our capabilities include environmental engineering, geology and hydrogeology, ecology, land use, human and ecological risk assessment, and remediation/decontamination using scientists and engineers who are recognized authorities in their respective fields, and who have demonstrated their ability to assess complex problems in a systematic manner.

We routinely team up with other consultants who have expertise in the areas of toxicology, air dispersion modeling, medicine, and specialized science.

Our services include:

- ◆ Environmental Consultation
- ◆ Site Reconnaissance
- ◆ Site Historical Contamination Assessment
- ◆ Data and Information Compilation and Management
- ◆ Data Validation
- ◆ Environmental Multi-Media Sampling and Analysis
- ◆ Environmental Studies and Assessments
- ◆ Exposure Assessments
- ◆ Forensic Investigations
- ◆ Economic Analysis and Engineering Cost Estimates

International Services

3TM Consulting provides services to clients throughout the United States. We have worked in about 30 states, including Texas, Louisiana, Arkansas, Mississippi, Oklahoma, West Virginia, New Jersey, New York, New Mexico, California, Florida, Michigan, Alabama, Colorado, and other states. We have also worked in Guam, Taiwan, Mexico, Venezuela, Ecuador, and Africa.



"We are life that wants to live in the midst of other life that wants to live."

Albert Einstein



Consulting Assignments and Studies

SITE HISTORICAL CONTAMINATION ASSESSMENT

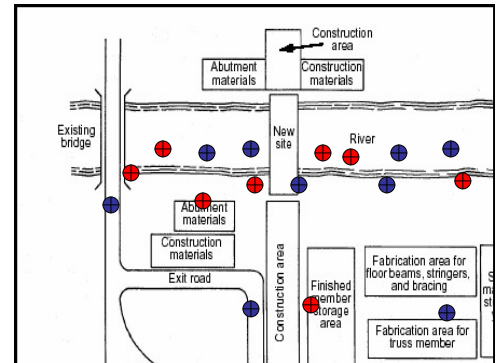
3TM Consulting routinely assists clients in assessing the historical contamination at a site. This may involve a search of historical regulatory records, aerial photographs, maps, USEPA Toxic Release Inventory (TRI) Data, and site reconnaissance.

Some projects are simple. Others are not. One of our larger projects to date has been the review of approximately 30 banker's size boxes of information, summarizing it into a nominal 100-page report for a group of attorneys.



PROPERTY ACQUISITION AND DIVESTITURE

3TM Consulting is frequently called upon by our clients to assist in the assessment of the environmental issues associated with property acquisition and divestiture. In doing so, 3TM Consulting has prepared Phase I Due Diligence Assessments ranging in complexity from a "simple Phase I" for a commercial property to comprehensive environmental baseline assessments associated with refineries, fuel terminals, and service station networks. We have also prepared assessments for large groupings of properties.



MERITS OF THE CASE EVALUATIONS

Frequently, technical assessment is required as part of making the decision of whether or not to pursue a certain litigation. In such instances, 3TM Consulting provides what we term "merits of the case" evaluations, that is, a study that quickly captures the technical and scientific issues associated with the site, such as the nature and extent of contamination, exposure pathways, potential receptors, potential confounders, and similar information. This aids the legal team in decision-making.

"Not everything that counts can be counted, and not everything that can be counted counts."

Albert Einstein

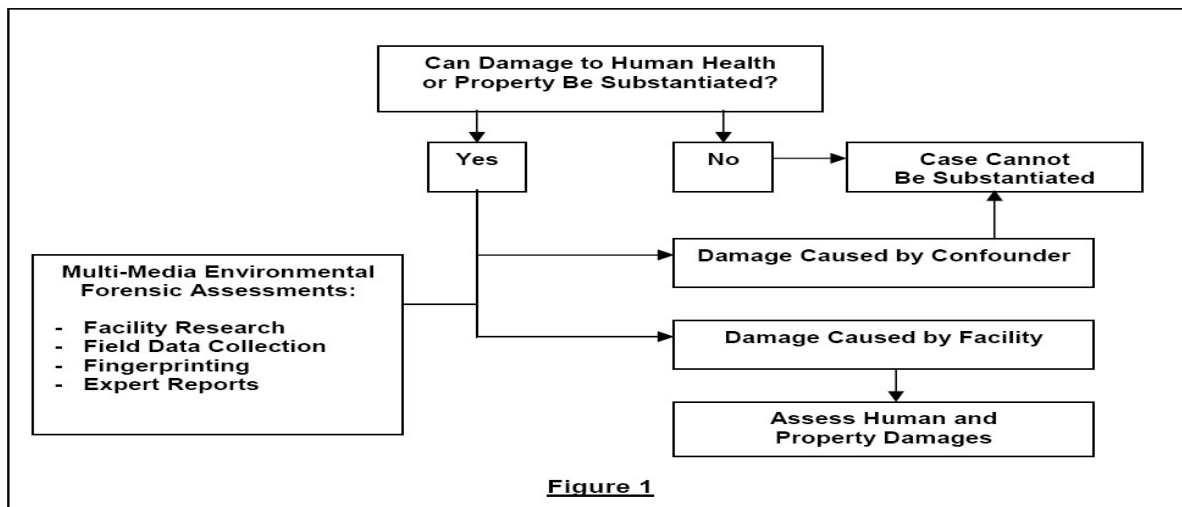


Figure 1

Environmental Multi-Media Sampling

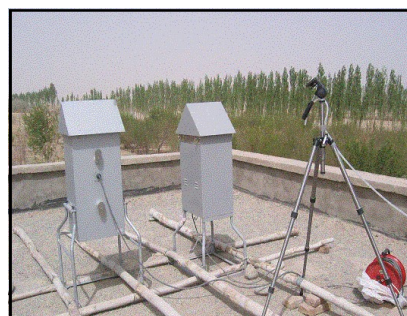
CONVENTIONAL FIELD METHODS

3TM Consulting has extensive experience in subsurface site characterization and the remediation of contaminated soil and groundwater.

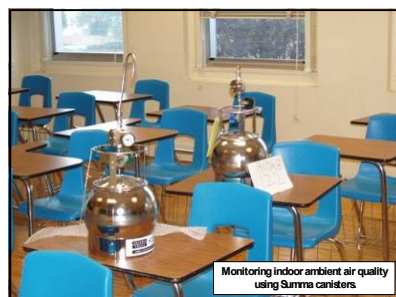
We have used manual samplers, conventional drilling rigs, and direct push technology (such as Cone Penetrometer Testing and Geoprobe) to sample soils, soil gas, and groundwater. The photograph to the right shows direct push technology being used to sample subsurface soils and groundwater to depths of up to 100 feet. This method allows for rapid and efficient sample collection, using procedures that are acceptable to court scrutiny.



Evaluating the impact of airborne particulate and gaseous emissions from a source requires the use of special field equipment and procedures. The photograph to the right shows the monitoring of airborne dust laden with PAHs and Dioxins/Furans which were impacting a large residential community. Indoor forensic sampling and testing confirmed high levels of Dioxins in indoor living environments, and chemical fingerprinting linked the receptors to the source.



3TM Consulting frequently uses Summa canisters to detect volatile contaminants inside buildings, the source of which is either vapor intrusion or external airborne emissions.

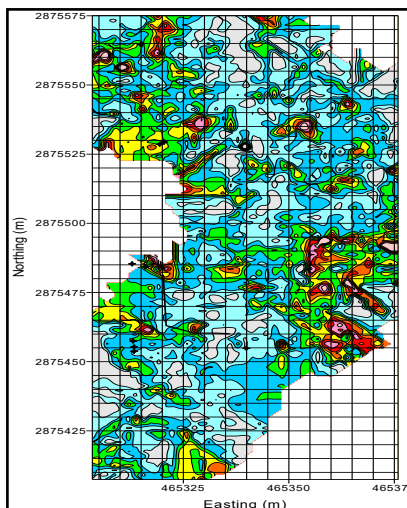


STATE-OF-THE-ART FIELD METHODS

3TM Consulting has used state-of-the-art field methods to detect and delineate subsurface contamination. When used with conventional field techniques, they provide powerful evidence in a courtroom.

The color plot to the right was generated in the field using advanced electromagnetic imaging (EMI) to detect anomalies associated with releases by an abandoned creosote facility in a Florida swamp. The red areas represent highly conductive areas, interpreted as DNAPL, at a depth of about 80 feet bgs. The green and blue areas represent likely background conductivity levels.

Conventional drilling was subsequently used to sample the soil and groundwater, indicating high levels of creosote-related PAHs at a depth of 75-80 feet bgs, and confirming the EMI interpretation.



Exposure Assessments

FATE AND TRANSPORT OF CHEMICALS

The release of toxic chemicals to the environment can occur from both routine and non-routine releases from a source. Once released, the chemicals become “contaminants” or “pollutants,” and can impact both human and ecological receptors.

Contaminants are initially released to surface soils or the local atmosphere or water bodies, where they are transported to other environmental media such as subsurface soils, sediments, groundwater, and household dust.

During the transport, various physical, chemical, and biological processes act upon the contaminants to degrade them or change their characteristics. The most important ultimate fate, of course, is the human body, where they can impact health and the quality of human life.

TOXIC EXPOSURE TO RESIDENTS

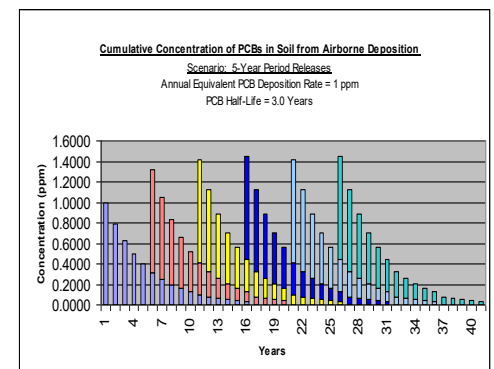
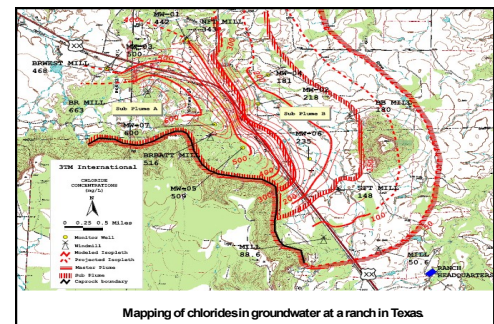
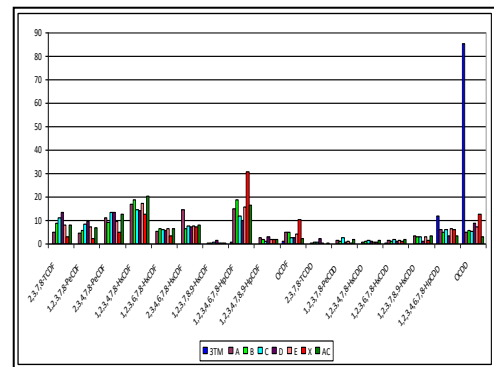
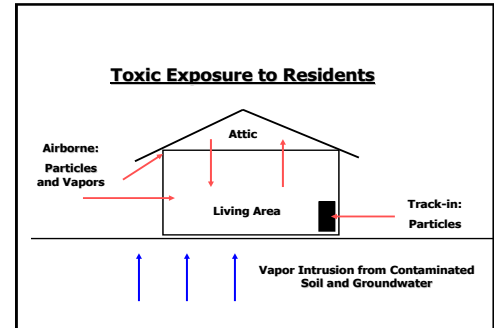
Research has shown that people may spend up to 90% of their time indoors.

Because of this, toxic household dust and vapor intrusion are emerging metrics for measuring exposure and risk to humans via contaminated indoor dust particles, airborne vapors, and subsurface vapors emanating from contaminated soil and groundwater.

3TM Consulting has developed specialized field techniques for collecting both household dust and soil gas samples. The samples are tested by forensic laboratories and then fingerprinted in order to rule in and rule out the sources of the contamination.

3TM Consulting has evaluated households contaminated with Benzene, PAHs, PCBs, Dioxins/Furans, pesticides, herbicides, toxic metals, carbon black, and toxic mold.

In some instances, the medical causation associated with these contaminants cannot be rationalized by only looking at current levels. Historical exposure to these chemicals is also important, and in many instances, the historical levels may be much higher than current levels. 3TM Consulting can assist you in this analysis by performing retro-calculations of contaminant concentrations in various environmental media using the principles of half-life contaminant decay.



Remediation, Restoration, and Decontamination

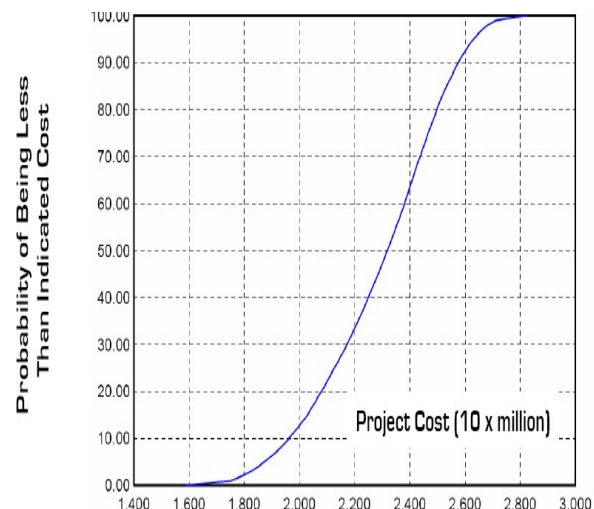
Law suits are filed. Discovery is made, and interrogatories are answered. The parties decide to settle. But, for what amount? And, on what basis? How do you assess damages?

Should the property be simply remediated or decontaminated, or should it be restored to pre-contamination event conditions? And, what are these conditions?

The term "Engineering Economic Analysis" may be defined as the analysis of the engineering, scientific, regulatory, financial, and logistical considerations and parameters associated with the environmental restoration of contaminated properties based on certain facts, assumptions, and calculations.

3TM Consulting prepares varying levels of Pro Forma Economic Analyses and comprehensive Engineering Cost Estimates for clients using information from the public domain and commercial contractors in order to establish unit rates and prices for the primary parameters associated with the analysis. The graph below represents a Monte Carlo parametric sensitivity analysis incorporated to provide insight into financial risks associated with varying total project cash outlays for environmental restoration. In this case, the economic simulation indicates that there is very low probability that the project cost will be less than \$16 million or more than \$28 million.

3TM Consulting has prepared hundreds of engineering cost estimates for remediation and restoration projects ranging from a few thousand dollars to several billions of dollars.



"Concern for man and his fate must always form the chief interest of all technical endeavors. Never forget this in the midst of your diagrams and equations."

Albert Einstein

Evidence and Courtroom Exhibits

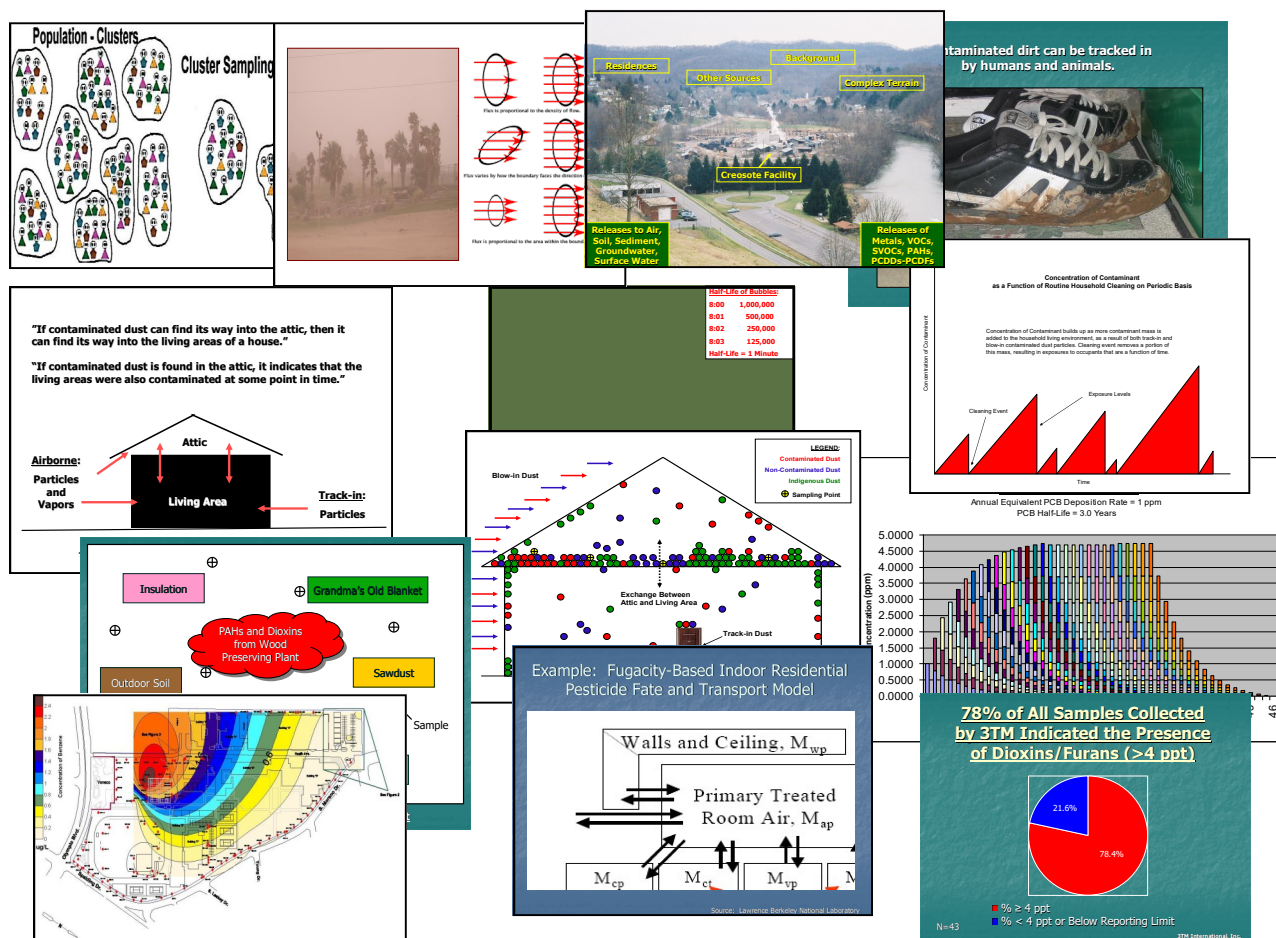
Courtroom exhibits can be simple or complex, depending on what is being conveyed to the court, the nature of the case, and the makeup of the jury.

3TM Consulting has worked with other experts in preparing courtroom exhibits that not only present facts but also educate and communicate, sometimes in a very simple manner.

For example, 3TM Consulting modeled the deposition of PCBs onto ground surfaces from historical releases from an industrial facility in order to explain to the jury how PCBs can accumulate over time and be detected in the residential surface soils surrounding the plant many years after the release had occurred.

Graphs can show the theoretical deposition rates and resultant soil concentrations over a 40-year release period, taking into consideration the half-life of PCBs. Such graphics can be used to retro-calculate soil historical soil concentrations in support of health-based exposure and risk assessments, for example, for diseases with long latency periods.

On the other hand, a photograph of a muddy shoe can be used to illustrate contaminant track-in, and bubbles in a bathtub can be used to illustrate the phenomenon of contaminant half-life.



3TM Projects Database

3TM Consulting has successfully completed more than 500 environmental projects, ranging in complexity from small consulting assignments to large litigation efforts totaling in the billions of dollars.

The following is a representative summary of our experience¹:

<u>PROJECT TYPE</u>	<u>NUMBER</u>
Site Reconnaissance	185
Records Review, Data Compilation, Phase I ESA	130
Geophysical Imaging / Electromagnetic Imaging	24
Multi-Media Sampling and Analysis	120
Control Group Sampling and Analysis	20
Fate and Transport Studies	56
Chemical Fingerprinting	45
Economic Analysis / Engineering Cost Estimates	115
Remediation / Decontamination	30
 <u>PROJECT SETTING</u>	 <u>NUMBER</u>
Chemical Plants	18
Commercial / Gas Stations / Dry Cleaners	42
Impacted Ranch or Farm Land	54
Industrial Sites	55
Manufacturing Plants	28
Oilfield Sites	72
Refineries	11
Wood Preserving / Treating Sites	36
 <u>PROJECT CONTAMINANT</u>	 <u>NUMBER</u>
Carbon Black	3
Chlorinated Hydrocarbons (TCA, TCE, PCE, EDC)	28
Dioxins/Furans	44
Mold and Biological Agents	9
NAPLs (DNAPL and LNAPL)	30
Pentachlorophenol (PCP)	18
Perfluorinated Hydrocarbons (PFOA, PFOS)	5
Polychlorinated Biphenyls (PCBs)	6
Radionuclides	16
Salinity / Total Dissolved Solid (TDS)	70
Semi-Volatile Organic Compounds (SVOCs) / Polycyclic Aromatic Hydrocarbons (PAHs)	88
Sulfur, Sulfides, and Inorganics	8
Total Petroleum Hydrocarbons (TPH)	66
Toxic Metals (RCRA, Priority Pollutant)	78
Volatile Organic Compounds (VOCs)	102

¹ As of March 2023



And God said, "It is good."

And then man came along and said, "Hey, we will make it better."

At 3TM Consulting, we are neither advocates for industry nor activists. We are engineers and scientists who enjoy high tech society as much as we enjoy nature. Our mission is to support our clients through the objective evaluation of environmental data and other information in order to resolve legal issues.

3TM CONSULTING, LLC

For further information, please contact us:

Randy D. Horsak, PE
PO Box 941735
Houston, Texas 77094
Phone: (281) 752-6700
Cell: (281) 850-6693
Email: rhorsak@3tmconsulting.com
www.3tmconsulting.com