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Scientific Advancements that Improve the Conceptual Site Model in Urban Hydrogeological Investigations

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Conducting hydrogeologic investigations in urban areas is a time consuming, expensive, and a scientifically complex endeavor. Maintaining a high level of scientific integrity in the face of the many challenges innately present in urban locations is often a daunting task. The most significant challenges include (1) getting the geology and hydrogeology correct at the appropriate scale, and (2) properly characterizing the nature and extent of the contaminant(s) at issue. These challenges become complicated in the urban setting due to legal issues, inaccessible sampling locations, and the many types of anthropogenic influences inherent in developed regions. Traditional investigations have commonly included installing a network of monitoring wells, many in arbitrary locations, as a basic framework to evaluate the nature and extent of contaminant plumes. However, in many instances the traditional investigative approach is inadequate for site characterization, results in failed remedial efforts, and is ultimately not protective of human health and the environment.

However, all is not lost, recently adopted investigative methods together with a series of forensic techniques are available to assist the scientist in achieving a successful outcome and involve using tools that enable geologic, hydrogeologic, and contaminant mapping down to the micro scale without installing monitoring wells. Using these techniques and methods represent a significant advancement in collecting reliable data. Thus, this advancement provides the scientist flexibility and increases the amount of data gathered from multiple sources in a much quicker period of time, which ultimately leads to the development of a conceptual site model that portrays actual site conditions. The outcome of using these methods can be used to target remedies to specific locations to better protect human health and the environment and significantly lower life-cycle costs and time required to complete remedial activities.

