

## **3-Dimensional Contamination Conceptual Site Model: A Case Study Illustrating the Multiple Applications of Developing and Maintaining a 3D Contamination Model during an Active Remediation Project on a Former Urban Gasworks Site**

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**Abstract :** A 3-Dimensional (3D) conceptual site model was developed using the Leapfrog Works® platform utilising a comprehensive historical dataset for a large former Gasworks site in Fitzroy, Melbourne. The gasworks had been constructed across two fractured geological units with varying hydraulic conductivities. A Newer Volcanic (basaltic) outcrop covered approximately half of the site and was overlying a fractured Melbourne formation (Siltstone) bedrock outcropping over the remaining portion. During the investigative phase of works, a dense non-aqueous phase liquid (DNAPL) plume (coal tar) was identified within both geological units in the subsurface originating from multiple sources, including gasholders, tar wells, condensers, and leaking pipework. The first stage of model development was undertaken to determine the horizontal and vertical extents of the coal tar in the subsurface and assess the potential causality between potential sources, plume location, and site geology. Concentrations of key contaminants of interest (COIs) were also interpolated within Leapfrog to refine the distribution of contaminated soils. The model was subsequently used to develop a robust soil remediation strategy and achieve endorsement from an Environmental Auditor. A change in project scope, following the removal and validation of the three former gasholders, necessitated the additional excavation of a significant volume of residual contaminated rock to allow for the future construction of two-story underground basements. To assess financial liabilities associated with the offsite disposal or thermal treatment of material, the 3D model was updated with three years of additional analytical data from the active remediation phase of works. Chemical concentrations and the residual tar plume within the rock fractures were modelled to pre-classify the in-situ material and enhance separation strategies to prevent the unnecessary treatment of material and reduce costs.

**Keywords :** 3D model, contaminated land, Leapfrog, remediation

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