

## MUS<sub>t</sub> 2: 用於含氯溶劑地下水污染場址之整合場址管理及健康風險評估的多污染物傳輸解析軟體開發

報告者：廖泓硯

指導教授：陳瑞昇 老師

梁菁萍 老師

報告日期：2024/09/27

### 摘要

地下水因化學物質處置不當而遭到污染的事件眾多，其中含氯溶劑作為常見的污染物，因其致癌以及重質非水相液體(Dense Non-Aqueous Phase Liquid, DNAPL)等特性，使得含氯溶劑污染場址的整治與健康風險的評估尤其重要。MUS<sub>t</sub> (MultiSpecies transport analytical model) 軟體應用監測式自然衰減(Monitored Natural Attenuation, MNA)的現地整治技術，以解析解模式模擬地下環境污染物的遷移範圍，同時擁有人體健康風險評估模組，量化經由飲用地下水所造成的風險，是目前最先進的整合評估軟體。然而就污染場址整治以及健康風險評估的步驟而言，建立場址概念模型(Conceptual Site Model, CSM)是關鍵的一步，這個步驟在 MUS<sub>t</sub> 軟體中開發地較不完整，所以本研究的目的是為此軟體開發一個全新版本(MUS<sub>t</sub> 2)，加入能將含氯溶劑污染場址的範圍、地質、水文、污染物分布等現地資訊以視覺化的方式呈現的功能，提供管理含氯溶劑污染場址的決策者一個更完整的評估流程以及良好的溝通。

**關鍵字：** 含氯溶劑、解析解模式、人體健康風險評估、場址管理、軟體開發。

## **MUSSt 2: A site management module and health risk assessment integrated multispecies transport analytical solution software for management of groundwater chlorinated solvents contaminated site**

Presenter: Hong-Yan Liao

Advisor: Prof. Jui-Sheng Chen

Prof. Ching-Ping Liang

Date: 2024/09/27

### **Abstract**

Groundwater contamination incidents caused by improper chemical disposal are numerous, with chlorinated solvents being one of the most common pollutants. Due to their carcinogenic properties and their behavior as Dense Non-Aqueous Phase Liquids (DNAPL), the remediation of chlorinated solvent-contaminated sites and the associated health risk assessments are especially critical. The MUSSt (MultiSpecies transport analytical model) software applies the Monitored Natural Attenuation (MNA) in-situ remediation technique, using analytical solutions to simulate contaminant migration in the subsurface environment. Also, it includes a human health risk assessment module to quantify risks associated with groundwater consumption, making it one of the most advanced integrated assessment software. However, in the process of site remediation and health risk assessment, developing a Conceptual Site Model (CSM) is a crucial step. This step is not fully developed within the MUSSt software. Therefore, the objective of this study is to develop a new version of the software, MUSSt 2, which extends the functions for visualizing information such as the range of the contaminated site, geological and hydrological conditions, and contaminants distribution. This will provide decision-makers with a more complete assessment process and have better communication in managing such contaminated sites.

**Keywords:** Chlorinated solvents, Analytical solution model, Human health risk assessment, Site management, Software development.