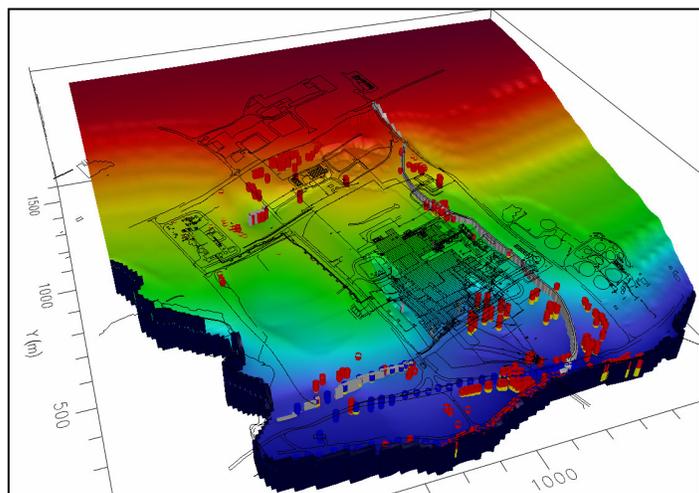


Transport and Phytoremediation of 1,4-Dioxane

Overview

This study investigated the transport and migration of 1,4-Dioxane at a site of a polyester plant that had been operating for the last 40 years. The main production process used ethylene glycol to produce polyester fibers for carpets and seat belts. Other onsite processes were the production and recycling of plastic materials. Modelling was used to assess the migration potential of 1,4-Dioxane past property boundaries and assess remedial alternatives, specifically phytoremediation. MODFLOW and MT3D were used to simulate groundwater flow and the transport of the 1,4-Dioxane in the system, respectively. It was concluded that phytoremediation would be effective and a pilot project onsite was initiated.



Project Results

A direct result of the modelling study was discovering the site's active phytoremediation processes. Even conservative simulations showed attenuation of 1,4-Dioxane commonly believed to be recalcitrant. Further simulations demonstrated that tree plantings would remediate 1,4-Dioxane and other dissolved constituents thus replacing the currently operating pump and treat system and resulting in significant cost savings.

The vast trench network is the primary transport conduit for the dissolved contaminants allowing for the greatest potential in offsite migration. Simulations demonstrated that close monitoring of these areas are needed.

Several remediation scenarios were simulated to design the optimal approach minimizing the movement of 1,4-Dioxane. The most cost effective approach is the planting of trees in key areas which will be followed by a 3 year monitoring program.

Groundwater Flow and Transport

The hydrogeological setting of the study area (150-200 acres) is comprised primarily of a shallow water table ranging 1-3 metres below ground surface. The overburden, composed of silty clay material and ranges between 2-5 metres thickness, and overlies a highly fractured limestone bedrock. Groundwater flow is mainly contained to the top 2-3 metres of bedrock along with an extensive trench network that is in place at the site.

Once the model was calibrated, a detailed sensitivity analysis of flow and transport parameters was performed to fully assess the uncertainty of parameters on model predictions. This included the examination of phytoremediation as there are approximately 100 - 150 trees all of which appear to be thriving along with several species of grasses and shrubs. It is estimated that transpiration of the site accounts 30% of the lateral groundwater flow through the system at the site.

