

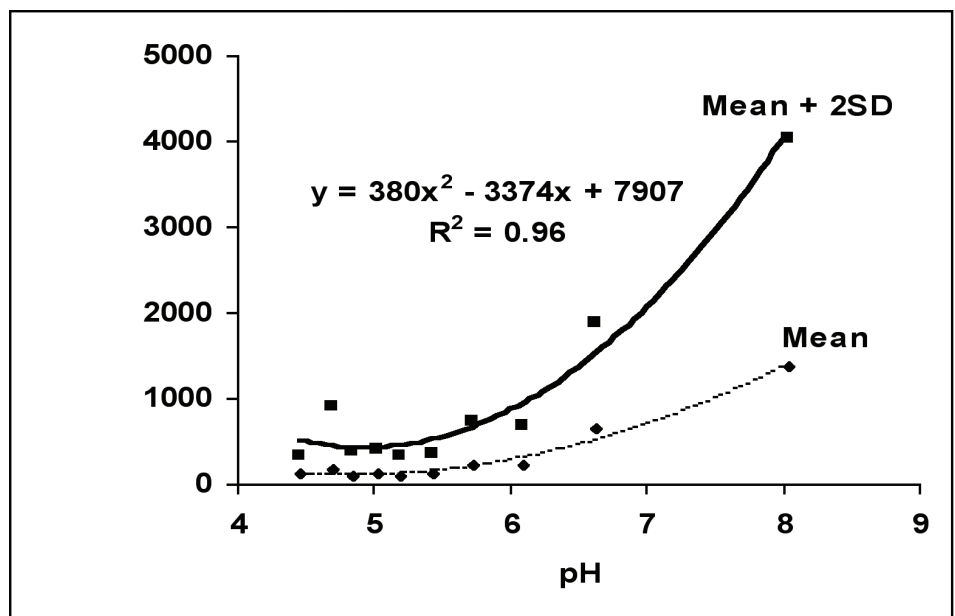
# Focus on CSIR Research in Water Resources

## Improved methods for Aquifer Vulnerability Assessments and Protocols (AVAP) for producing vulnerability maps, taking into account information on soils

Groundwater resources are increasingly threatened by pollution. The AVAP project was initiated to develop improved methods for vulnerability assessments in urban catchments, with particular emphasis on the integration of available soils information in vulnerability assessments. The outputs of the project will help to ensure that land-use decision making does not result in groundwater pollution.

Aquifer vulnerability to contamination comprises two components: unsaturated zone vulnerability and saturated zone vulnerability. For the unsaturated zone vulnerability indices were developed for the Soil Zone and the Intermediate Zone.

From pedogenic information and batch experiments the project developed a new groundwater vulnerability classification system of South African soil forms based on (1) hydraulic attenuation, and (2) chemical attenu-



Cu sorption data for 170 soils as a function of soil pH (in CaCl<sub>2</sub>).

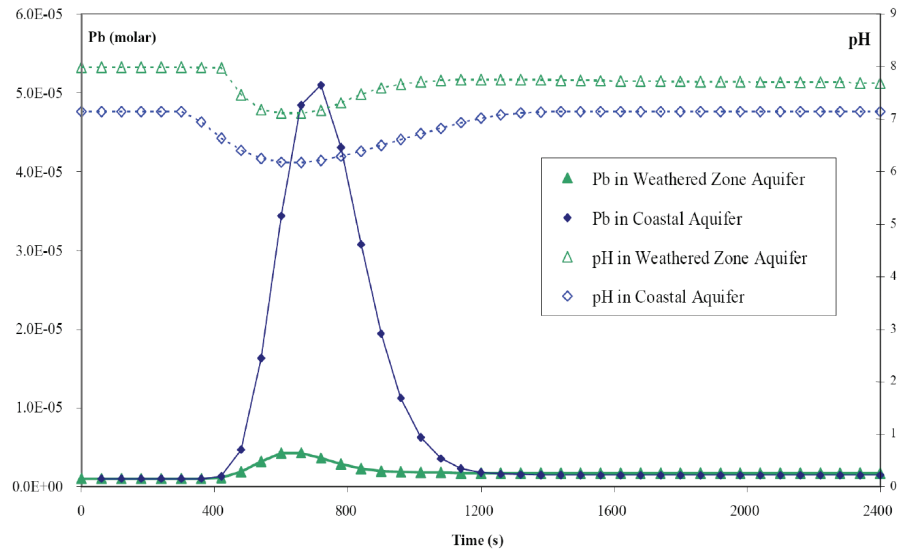
ation characteristics. Both intrinsic and specific vulnerability are taken into account. The approach used to determine the vulnerability of the intermediate zone involved the description and quantification of the factors that influence vulnerability (unsaturated thickness, hydraulic properties and flow mechanism, recharge, travel time, sorption and decay), and developing guidelines for quantifying their relative importance.

Two GIS-based algorithms were developed that incorporate the results of the unsaturated and saturated zones in determining aquifer vulnerability:

- ReSIS layer method (a revised DRASTIC method) – an index model that makes provision for the scalability of the data, and allows for the inclusion of coarser resolution data sets.

- Revised UGIf method – a process-based model using analytical approaches which can deal with contaminant specific vulnerability.

A decision-making framework was developed for landuse and water resource managers to enable the integration of the AVAP assessment tools in decision making. Three main stages in aquifer vulnerability decision making was identified: (1) Scoping, which analysis the need for vulnerability assessments; (2): Assessment, which selects and applies the most appropriate assessment method; and (3) Decision-making, which includes the analyses of costs and benefits and ultimately the formulation of management decisions and recommendations.



Lead concentration (moles/litre) and pH vs. time at specific distance from the source in coastal and weathered zone aquifers



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UGIf model: Predicted Vadose Zone Travel Times for Benzene in Recharge Waters around Coastal Park Area.

