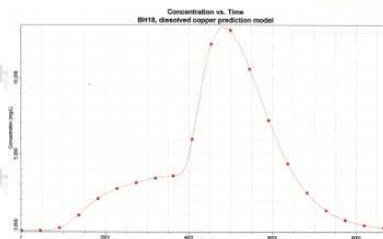
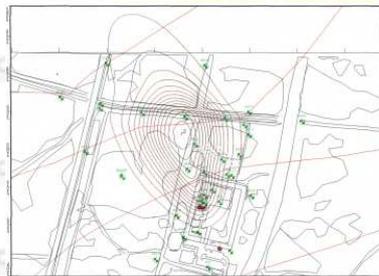
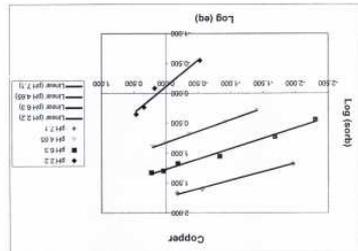
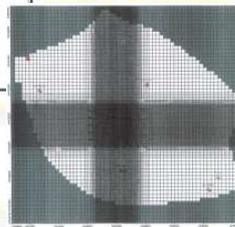
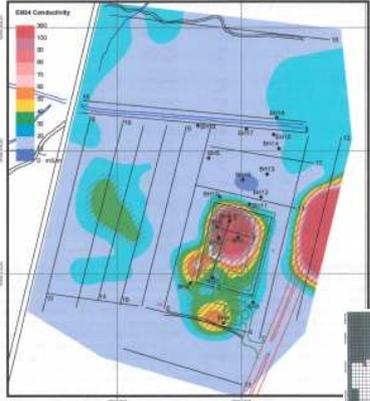




## PROJECTS

### RISK ASSESSMENT

Ecological Risk Assessment, Groundwater heavy metal plume affecting surface water quality within an artificial drain leading to the high-value river Risk 7



A precious metal refinery collects process effluent from aqua-regia digest & other processes via gravity feed in a lined underground storage tank (UST). The effluent is highly acidic and contains high concentrations of zinc, copper and other metals. The effluent is subsequently neutralised before off-site discharge to sewer as a trade effluent.

During a routine maintenance inspection groundwater ingress was observed to be occurring into the UST. A monitoring bore adjacent & downgradient of the UST recorded a groundwater pH<2, and copper, iron and zinc concentrations of between 126 and 2,700 mg/L. Further investigation identified a metals contaminant plume in groundwater extending downgradient (northeast) of the refinery, and reaching an artificial drainage channel used to control groundwater levels. Subsequent monitoring of surface water quality indicated elevated metal concentrations in surface water within the drain.

An ecological risk assessment was undertaken to assess the impact of the refinery effluent leakage and migration within groundwater to affect surface water quality:

- A geophysical electromagnetic Em34 survey was undertaken to assess the plume extent
- Ecotoxicological testing was undertaken using groundwater from the groundwater-drain discharge zone & surface water samples on freshwater algae
- A flora and fauna survey was undertaken along the drain to assess any discernible changes over the groundwater discharge zone
- Sorption isotherms were calculated for metals species mobility in groundwater
- A numerical groundwater model was constructed in MODFLOW & calibrated against historical groundwater levels.
- UST leakage rates were estimated based on comparing groundwater and effluent chemistries.
- A solute transport model was then constructed using the MT3D module.
- Predictive model scenarios were developed to assess the future impact on drain water quality from a 'do-nothing' to various intervention strategies.

HydroSolutions Pty Ltd  
U14/14 Whyalla Street  
Willetton  
Western Australia 6155  
Tel: (+61 8) 9457 5448  
Fax: (+61 8) 9457 4293  
Mob: 0403 021533

E-mail: [stuart.jeffries@hydrosolutions.com.au](mailto:stuart.jeffries@hydrosolutions.com.au)  
Website: [www.hydrosolutions.com.au](http://www.hydrosolutions.com.au)