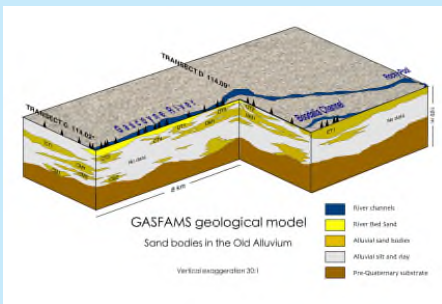


Modelling Capabilities



HYDROSOLUTIONS
PTY LTD
Hydrogeological & Environmental Consultants

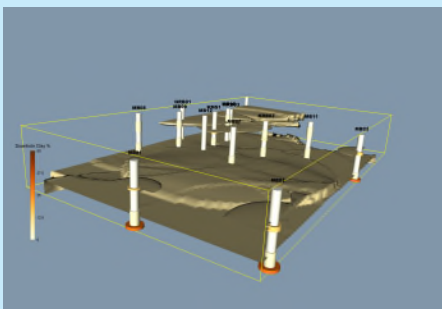
Western Australia's independent groundwater & environmental consultancy, with a proven track record in groundwater, surface water, environment, risk assessment & contaminated land management. We combine reliable expertise with regulatory knowledge, delivering high-quality output on time & on budget.



Conceptualisation

Our modelling group is an integrated, multi-disciplinary team, supported by in-house geology, hydrogeology and GIS specialists. We specialise in high-level technical conceptualisation:

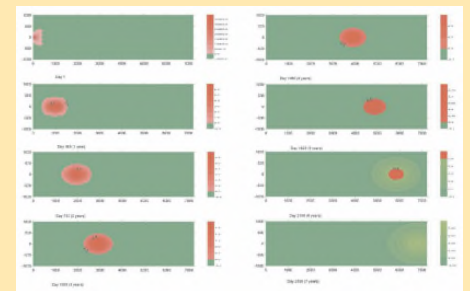
- ◆ Geological modelling and analysis
- ◆ Regional groundwater analysis
- ◆ Conceptual Site Models (CSM)
- ◆ Water balance studies
- ◆ 3D spatial analysis of hydrogeological systems
- ◆ GIS analysis with MapInfo; Discover; QGIS
- ◆ Borehole visualisation/correlation with Strater; Discover; QuickLog
- ◆ 3D+ visualisation with Voxler



Hydraulic Modelling

We apply 30 years of experience in all forms of hydrogeological modelling to our projects, from core analytical models to the most recent multi-parameter uncertainty analysis:

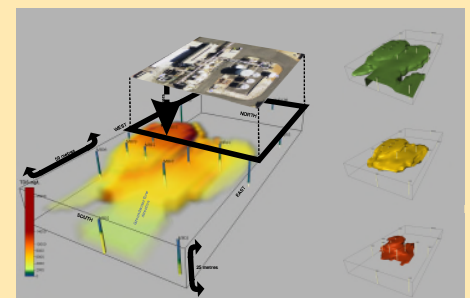
- ◆ Analytical models with AquiferTest using Theis (confined), Neuman (unconfined), Walton (semi-confined/leaky) methods
- ◆ Numerical modelling with Groundwater Vistas, MODFLOW, ModelMuse
- ◆ Automated parameter estimation with PEST
- ◆ Dewatering assessments
- ◆ Managed aquifer recharge (MAR)
- ◆ Sustainable yield assessment
- ◆ Well efficiency assessment
- ◆ Recharge estimates
- ◆ Source protection models (SPZ)
- ◆ Ground/surface water interaction
- ◆ Groundwater Dependent Ecosystem (GDE) impact analysis
- ◆ Vadose (unsaturated) zone models
- ◆ Monitored natural attenuation (MNA) assessments
- ◆ FlowPath (source protection zones)
- ◆ Mars-2/3D (Multiphase Areal Release Simulator)
- ◆ AAMGL assessments
- ◆ Climate change (stochastic) assessments



Solute Transport Models

Recent major projects have involved 3-5D, data-rich, solute transport modelling and contaminant recovery analysis, including:

- ◆ Hydraulic containment
- ◆ Flow path analysis
- ◆ Source Protection Zone (SPZs)
- ◆ Multiphase flow and transport in the vadose (unsaturated) and saturated zones
- ◆ Solute transport models for in-situ remediation, with MT3D/RT3D & Bioplume
- ◆ Pump & treat remediation
- ◆ Density & heat coupled models with SEAWAT
- ◆ Monitored natural attenuation (MNA) assessments



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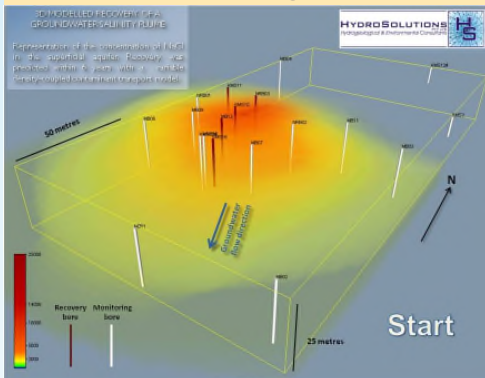
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Example Modelling Projects

Brine recovery, Chlor-alkali plant

Subregional hydraulic model, site-specific daughter model, calibrated solute transport model, heat & density-coupled using SEAWAT. Predictive scenarios to recover large salt plume.



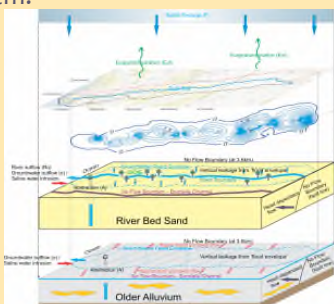
Construction dewatering

Dewatering models for construction of residential drain networks & waste water treatment infrastructure.

- ◆ Canningvale residential development
- ◆ Banskia Grove WWT pumping station
- ◆ Banjup Waste Water Treatment pumping station

GASFAMS Conceptual Model

DoW acclaimed conceptual model for the Cymod Systems Gascoyne Aquifer Flood plain Modelling System (GASFAMS). Regional level conceptual model for the Carnarvon water supply system.

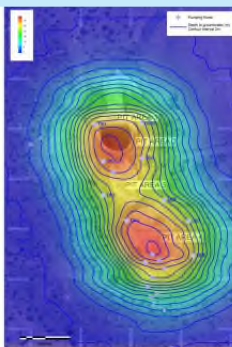


DEWATERING MODEL OF A GOLDFIELDS MINESITE

Requirement to achieve a 30m drawdown within 100 dpa in an unconfined fractured rock aquifer.

- Transmissivity 50mD
- Saturated thickness 100m
- Elastic constant 0.01
- Specific yield 0.1
- Abstraction from 11 bores
- Abstraction rate between 700 and 2750 m³/d
- Total abstraction 21,850 m³/d
- Volume abstracted 13,095,000 m³ to 100 dpa
- Clipping abstraction from 450 to 1400 m³/d
- Clipping total 11, 100 m³/d

Day 70



Department of Defence

An analytical model for the VLF array at Harold E. Holt Base, Northwest Cape simulated power station cooling water abstraction from shallow karst limestone affecting a stygofauna habitat. A conceptual site model for the remediation of a non-aqueous phase liquid was also established, with an hydraulic containment model.

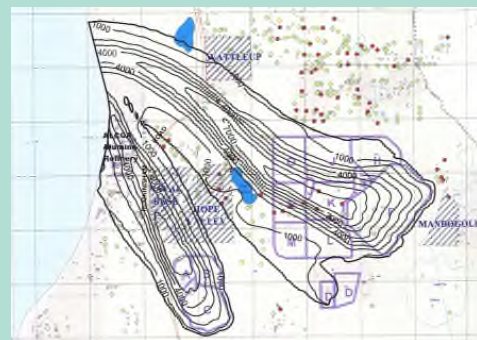


Dewatering Assessment of Open-Pit Aggregate Extraction

A MODFLOW numerical model was calibrated against 10+ years of historical hydrographs. Dewatering scenarios were run to assess the potential for settlement affecting surrounding properties.

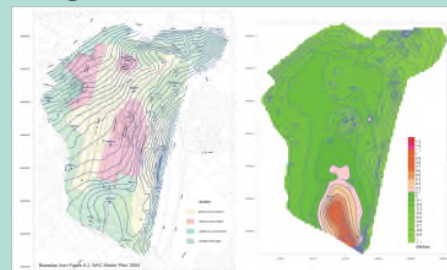
Recovery of Metal Refinery Plume

Establishment and calibration of a sub-regional hydraulic & solute transport model. Simulation of off-site migration of a dissolved metal plume affecting a shallow sand, silt & clay aquifer. Recovery using pump & treat or disposal to sewer was examined to identify optimum recovery.



Perth Airport Sub-regional Model

Numerical modelling in conjunction with Cymod Systems predicted impacts from increased abstraction at the airport, including the effects on a proposed "living stream" development, the average annual maximum groundwater level (AAMGL), and future site development. Stochastic assessment of climate change effects was also modelled.



BHP Billiton Iron Ore, Pilbara

Local numerical model of a fractured & weathered basement aquifer, developed using FLOWPATH. Particle tracking analysis identified 50-day, 1-year and total catchment areas, as part of a source protection plan for a potable water source.



Mineral Sands Operation, dewatering assessment

Initial analytical model assessing potential impacts from dewatering on license holders & GDEs

