

# South Australian - Department of Environment, Water and Natural Resources

Whilst land use and the usage of groundwater reserves by farmers and industry has changed dramatically over time, the process for monitoring the resource has remained virtually unchanged over the last 100 years.

To maintain the network of groundwater monitoring stations is a massive and costly process for government to manage, given the level of usage and understanding in any given groundwater system can change over time. Where a large network of monitoring stations may have been required in the past, they may not be needed today or into the future as requirements change.

## Project Background

The current network of wells monitored by government has been built up over the last century. Generally a monitor was installed wherever water was extracted. Nowadays users of groundwater range from viticulture to dairy, orchards, and mining. Most monitors don't have telemetry so to take a reading, the responsible government agency needs to send someone physically out to the site. As land use changes over time the investment in monitoring between management areas needs to be reviewed to match usage. NICTA has developed a platform to determine the optimal number of sites for different scenarios. This is accomplished by understanding how each measurement contributes to the overall confidence in the water pressures and levels throughout the region.

## What is the technology?

Through the use of machine learning algorithms, the value of each individual monitoring bore can be determined to give an overall understanding of the underground water levels in that area. The software will enable government to remove or add the right monitoring bores to a monitoring system, to ensure an adequate understanding of the groundwater pressure.

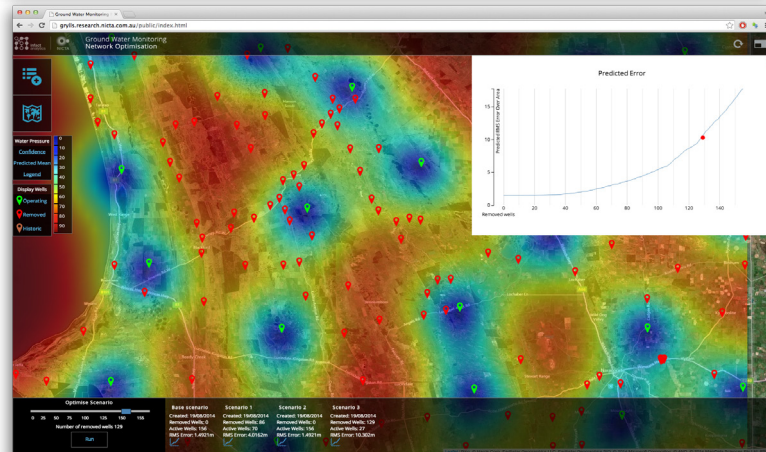
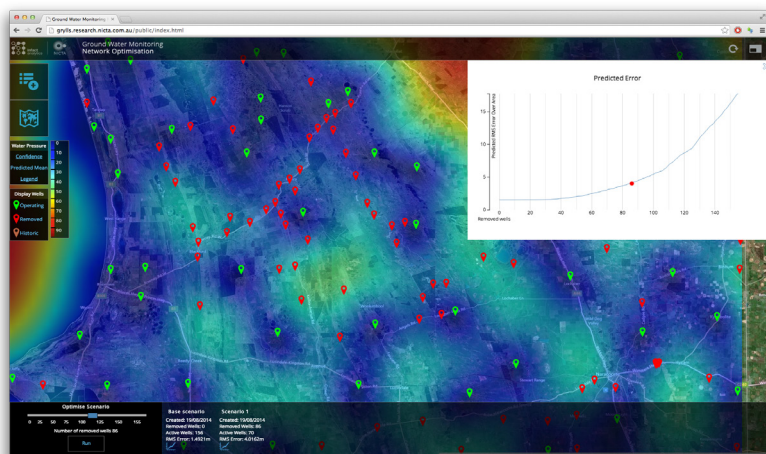
The technology quantifies the effect of removing a number of sites from a monitoring network, allowing the optimal number of monitoring stations to be determined subject to current requirements.

## NICTA's unique approach

The system NICTA has built for groundwater monitoring network optimisation focuses on ascertaining the water pressure level in a given aquifer system. The software produces a heat map that captures the confidence in the spatial reconstruction that a reduced network of monitoring wells will produce.

## Collaborators

NICTA is piloting the technology through its environmental analytics subsidiary company, Infact Analytics. The South Australian Department of Environment, Water and Nature Resources (DEWNR) is the main benefactor of the research through a pilot program.



**The optimal set of monitoring wells are depicted in green, based on the requirement to stop monitoring at 50% (top) and 75% (bottom) of the existing wells. The heat map overlay captures the estimated error of the spatial reconstruction of the water pressure and levels throughout the area. The insert captures the overall increase in reconstruction error (vertical axis) that a reduced network of monitoring bores will produce based on a user specified number of bores to keep (horizontal axis).**

## Status

NICTA and DEWNR are focused on a pilot of the technology in the Coonawarra region in South Australia. The Limestone coast is one of the heaviest groundwater extraction zones in South Australia.

Across a 1000 square kilometer area, hundreds of monitoring stations are managed by DEWNR. The pilot began in June 2014 and will continue for one year.

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NICTA is Australia's Information and Communications Technology (ICT) Research Centre of Excellence, driving innovation through high quality research, research training, commercialisation and contract research.

NICTA has the largest concentration of ICT researchers in Australia. Our research focuses on use-inspired basic research that benefits industry, the community and the national interest.

Since NICTA's inception in 2002, NICTA has built strong research capability in:

- Software Systems
- Networks
- Machine Learning
- Computer Vision
- Optimisation.

Our Business Teams are the market focus of our research capabilities:

- Broadband and the Digital Economy
- Infrastructure, Transport and Logistics
- Security and Environment.

NICTA researchers work on Business Team projects supported by:

- An Engineering and Technology Development Team
- IP, Legal and other professional support.

Our work as a world-class research institute and Centre of Excellence in science and innovation brings together many of Australia's and the world's top ICT researchers. NICTA provides them with the facilities and support they require, making imagination to impact a reality.

NICTA's unique approach fosters and develops ICT research. We work closely with both industry and other research institutions to solve problems and make breakthroughs in ICT with real impact. NICTA's focus on use-inspired research means our projects have direct relevance to the challenges faced by business, government and individuals around the world. The result is breakthrough technologies that provide commercial opportunities and have a positive impact on Australia's export earnings.

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