



A COMMERCIAL APPLICATION OF VIROFLOW™ TECHNOLOGY

CASE STUDY: ORIGIN ALLIANCE, GROUNDWATER TREATMENT

ViroFlow™ Technology treatment was successful in lowering contaminant metal concentrations to well below customer requirements and in improving general water quality in the treated groundwater.



Electrobind™ mixing tank

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PROBLEM

The Queensland Department of Main Roads is currently completing the Dinmore to Goodna motorway upgrade. These major road works are taking place near Ipswich where there are many historic underground mine shafts and workings. The mine shafts are filled with contaminated groundwater and require extraction of the groundwater and stabilization prior to the commencement of road works.

The water emanating from the mine shafts is characterised by low pH and high heavy metal and high dissolved salt loads. Due to the high salt content in the water, and the requirement to reuse the water for on-site concrete batching, reverse osmosis (RO) was required for final treatment of the water. The key problem for Origin Alliance was to find a suitable pre-treatment for the RO system to remove the significant heavy metal contamination prior to RO treatment.



Figure 1 - An aerial view of the Dinmore to Goodna motorway upgrade

VIROTEC TOTAL SOLUTIONS

Virotec was contracted by members of the Origin Alliance to install an RO pre-treatment system. The key objective was to find a suitable pre-treatment system to remove groundwater contaminants. The Virotec total solution involved applying ViroFlow™ Technology using the proprietary ElectroBind™ reagent.

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Implementation of ViroFlow™ Technology achieved the following outcomes for the Origin Alliance:

- > Elimination of a major environmental hazard, and a potential environmental incident if groundwater was accidentally discharged;
- > Treated water was re-used with trace metal concentrations (particularly aluminum, iron and manganese), total suspended solids concentrations, and pH that were within guidelines for reverse osmosis feed water;
- > Fast mobilisation and short treatment timeframe; and
- > Customer satisfaction.



Figure 2 - Reverse osmosis system at the site

BACKGROUND

The Queensland Department of Main Roads had established the Origin Alliance project to deliver the Ipswich Motorway Upgrade between Dinmore and Goodna. The Origin Alliance team consists of The Department of Main Roads, Abi-group Contractors, Fulton Hogan, Seymour Whyte, Parsons Brinckerhoff and SMEC.

This project was the largest Road Alliance Project ever undertaken by the state of Queensland. Construction started in mid-2009 and is due for completion in 2012. Groundwater treatment also commenced in mid-2009. The Origin Alliance had considered several types of pre-treatment technology, including the use of caustic soda and flocculants to remove the heavy metals. Bench trials had shown that conventional alkaline technology and flocculants were not suitable in

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removing the heavy metals to levels suitable for reverse osmosis feed water.

Virotec had successfully demonstrated to the Origin Alliance in simultaneous bench trials that ElectroBind™ reagent was superior for heavy metal removal, suspended solids removal and pH optimisation. ViroFlow™ Technology was subsequently chosen as the preferred pre-treatment method for the full-scale implementation of groundwater treatment.



Figure 3 - The groundwater treatment plant at the Origin Alliance site

TREATMENT METHOD

ElectroBind™ reagent was supplied to the Origin Alliance in powdered form and mixed into a slurry via an automated dosing system. The slurried product was then dosed with the contaminated groundwater to adjust pH and remove heavy metals in the primary clarification unit. Once the ElectroBind™ reagent particles had settled, the supernatant water was fed to an ultra-filtration system and then to the reverse osmosis treatment system.

The treated water was used for the nearby concrete batching plant which supplied concrete to the motorway construction project teams, thus completing the water recycling loop for the entire construction project. The ElectroBind™ reagent mixing tank is shown in Figure 4 overleaf.

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Figure 4 - ElectroBind™ reagent mixing tank.

RESULTS

After treatment with ViroFlow™ Technology, the heavy metals, pH and suspended solids were dramatically reduced. Treatment results and initial contaminant levels are summarised in Table 1 below.

TABLE 1: WATER TREATMENT RESULTS

Component	Before Treatment (mg/L)	After Treatment (mg/L)	RO Feed Water Requirements (mg/L)
pH	3.5 – 4.0	7.0	6.5 – 7.5
Iron	80.7	0.005	<1.0
Manganese	2.29	0.87	<1.0
Aluminium	55.4	0.005	<1.0
Suspended Solids	15	0.08	<1.0

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CONCLUSION

ViroFlow™ Technology treatment was successful in lowering contaminant metal concentrations to well below customer requirements and in improving general water quality in the treated groundwater. ViroFlow™ Technology has proven to be a highly cost-effective treatment for the contaminated ground water for this project, and it can be easily installed for similar reverse osmosis pre-treatment projects.

The Virotec total solution gave the following outcomes to the customer:

- > Meeting the desired water quality goals for the project;
- > No fouling of the ultra-filtration system or reverse osmosis membranes;
- > Low cost compared with other treatment methods such as flocculants; and
- > A proven technology, using an EPA approved methodology, to remove contaminants from groundwater.

TESTIMONIAL

“Virotec Global Solutions were contracted to treat approximately 1,000,000 liters of heavy metal contaminated groundwater from underground mine shafts. We originally started using chemical products to extract the metals out of the water and found that it caused fowling issues with the RO membranes and the Ultra Filtration filters.

Virotec Global Solutions introduced us to their ElectroBind™ product which greatly reduced the maintenance of both of these pieces of equipment. The ElectroBind™ also reduced the metals to well below the EPA requirements for disposal or reuse.

The use of ElectroBind™ was far more cost effective than chemical dosing as the addition rate was much smaller.

We would recommend other companies to use Virotec Global Solutions for any heavy metal contaminated water issues.

Peter Nil

**Operations Manager,
Brisbane, Queensland.**