

# HDD helps expand water supply in NSW

## UEA uses Vermeer drill rig to power through rock formations

By Greg Keane, Technical Writer, Vermeer Manufacturing Company

The recent Shannon Creek Storage Facility project undertaken by Leighton Contractors on behalf of the Clarence Valley Council and North Coast Water will provide 30,000 mega litres of water storage for the towns of Coffs Harbour and Grafton in northern New South Wales. The population of this region is projected to grow from 90,000 to 220,000 by the year 2050.

### Accessing the water

An environmentally protected escarpment forms one wall of the dam. It presented an engineering challenge as a natural barrier to bringing communications and power services into the dam, and taking water away from the dam. As the escarpment is 50 – 60 metres in height above the level of the pumping station, it also adds difficulty to the task of pumping water from the dam.

Leighton Contractors realised that it was necessary to bore through the escarpment to connect these services, and engaged specialist drilling contractor UEA Pty Ltd to undertake this work as a subcontractor. UEA had recently purchased a Vermeer Navigator® D300x500 horizontal directional drill – the first such unit in Australia.

The scope of work encompassed four straight bores, each of approximately 330 metres, to link with services laid up to the eastern side of the escarpment. The bores were to house a 110 mm diameter communications conduit, two 140 mm diameter electrical conduits and a 900 mm water main, with all conduits to be polyethylene.

Because of environmental constraints, a geotechnical investigation could only be conducted in the valley areas. The sandstone outcrop surrounding the Shannon Creek area was likened to Hawkesbury sandstone found around the Sydney basin, and its strength was estimated at 40 – 60 MPa (5800 – 8700 psi).

### Harder than expected

The project seemed ideal for the Vermeer Navigator D300x500 rig, as its rail could be positioned horizontally against the vertical face of the escarpment, facilitating the six percent upward grade required for the bore. A Digitrak Eclipse Steering Tool would be used to guide the pilot bores through the escarpment to the exit point.

While drilling the pilot bores and installing the small diameter conduits, UEA realised that the ground conditions were much harder than originally thought. UEA decided that the reamer it planned to use for the large diameter bore would be inadequate, and that hole openers would be required. The ground hardness was estimated at up to 120 MPa (17,400 psi) in places, requiring specification of medium formation hole openers. A 1066 mm diameter hole opener was required for the 900 mm water main.

### Tough work made easy

Despite the hardness of the rock UEA director Keith Whittaker said, "The Vermeer handled the 42-inch opener very easily, and it was unusual for it to be off idle and under load for the entire project."

Because the hole was installed on an upward grade, it was self-cleaning. This eliminated the need for complex drilling muds, and the only mud used on the job was for the pilot bores.

Large volumes of recycled water were used to flush the hole of cuttings at the low exit point, and keep the cutters submerged in fluid. The water flowing through the rods was supplemented with recycled water fed through the already installed electrical conduit, to provide sufficient volume.

Although the water pipe had a 90 tonne dead weight, it was easily installed and pull back force did not exceed 10 tonnes during the operation.

The Vermeer drilling rig handled the unexpectedly severe conditions of the site, and allowed UEA to provide the clients with a solution that overcame these challenges.



A recently completed project was the Eastlink project in Melbourne, where VMT provided multiple guidance systems on roadheaders, excavators and rockbolting machines.

The company is currently supplying eight roadheader guidance systems and two large diameter TBM guidance systems for works on the North South Bypass tunnel in Brisbane. Further to this another roadheader guidance system is being used on the Boggo Road busway tunnel which is also in Brisbane.

The hardrock TBM currently constructing the tunnels for a hydro electric power station in the Kiewa valley is also utilising VMT guidance technology.

In the smaller diameter tunnelling market in Australia, VMT currently has two guidance systems on small diameter TBMs, constructing both the intake and outfall tunnels for the Gold Coast Desalination Plant. Also, in association with this project, VMT has already used its extended distance and curved pipejacking guidance system on the pipeline that transfers the desalinated water from the plant to the reservoir and distribution system.

In the coming months of 2008 VMT equipment will be being used on several other projects including:

- April 2008 – Use of an SLS-LT system by McConnell Dowell and the introduction of an SLS-SL system to the TBM on the Sydney Desalination project.
- May 2008 – An SLS-SL system will be used on the TBM for the Melbourne Northern Sewer project and a further SLS-SL system will be being utilised on the Sydney Desalination project.
- June 2008 – On the Melbourne Northern Sewer project an additional SLS-SL will be working.
- July 2008 – McConnell Dowell will be utilising an SLS-LT system.
- August 2008 – McConnell Dowell will be utilising a further SLS-LT system.

*To support and expand the increasing use of VMT guidance and navigation systems across Australia a new company, VMT Tunnel Guidance Pty Ltd, has been established.*

On the Sydney Desalination project work comprises the utilisation of two small diameter, segmentally lined intake and outfall tunnels plus three pipejacking machines for use on the installation of the associated pipeline network.

The desalination plant itself will be powered totally by renewable energy and will produce some 250 million litres of water per day.

For the Northern Sewer project in Melbourne, VMT will supply two guidance systems for small diameter segmentally lined tunnels. Work has already been completed to measure the moulds that will be used to make the segments at the Korean Mould company in Korea.

To support and expand the increasing use of VMT guidance and navigation systems across Australia a new company, VMT Tunnel Guidance Pty Ltd, has been established. Whilst giving domestic Australian companies a local source of equipment and expertise, the new company will be working very closely with VMT in Germany to ensure that the guidance and navigation

# Major tunnelling projects for VMT

For many years now VMT GmbH has been a leading provider of tunnel guidance systems worldwide. The past few years have seen a significant increase in the company's product ranges being introduced onto major tunnelling projects across Australia.

needs of the Australian tunnelling market are fully met.

For those wishing to know more about the company's systems, VMT will be exhibiting at the 7th National ASTT Conference and Exhibition in Sydney between 2-5 March, on stand 20. Furthermore, Alex Seilert will be presenting a paper at the event on the Monday morning covering VMT's guidance systems for pipejacking.

The logo for VMT, consisting of the letters 'VMT' in a bold, sans-serif font, is centered within a large, empty rectangular frame.

# Tallawarra gas pipeline project

A joint venture consisting of Nacap Australia/Tru Energy recently installed a 272 mm steel gas main under the F3 Freeway, Ducks Creek and the Illawarra Railway Line. The pipeline is to supply gas from a spur off the Eastern Gas pipeline to a new 400 Mw gas fired power station currently under construction for Tru Energy.

The joint venture engaged UEA Pty Ltd to undertake HDD works including the boring and installation of 763 m of 272 mm steel pipe in rock rated up to 120 Mpa. UEA used its recently purchased Vermeer D300 x 500 (136 t) as well as a DFE 700gal/min recycling system, and 700 gal/min Weatherford mud pump.

Site specific problems included varying rock strengths and fractured rock; depth to allow for clearance of bridge piers on the F3 Freeway, the bore was required to be at least 28 m deep; dealing with the requirements of State Rail for the Illawarra rail line crossing; and, tight tolerances imposed on the bend radius.

