

HDD record set on Mardi-Mangrove Link Project

UEA recently completed the first installation of a 1,200 mm diameter SDR11 PN16 HDPE water main in Australia using a horizontal directional drill.

THIS BORE WAS for the Wyong creek crossing that formed part of the Mardi to Mangrove Link Project undertaken by John Holland for Gosford City Council and Wyong Shire Council. The project secured \$A80.3 million in federal government funding from the Water Smart Australia program, and \$A40 million in funding was provided by the councils themselves.

The project called for a 2.1 km buried water pipeline from the Wyong River to Mardi Dam, a 19 km buried pipeline through the Yarramalong Valley from Mardi Dam to the existing Bunning Creek Tunnel, two new pumping stations, and associated works. UEA subcontracted to John Holland for the horizontal directional drilling (HDD) works.

The creek crossing was originally planned as a microtunnelling project but ground conditions and the 10 m depth of the required shafts led John Holland to look at alternatives. Due to the Federally

Protected Riparian Zone and platypus habitats, a pipe bridge was not possible in this location. Because 1,200 mm PE water main was not available in Australia and had not previously been installed by HDD, it was not originally considered. However, UEA found a pipe source in Austria and calculated that its Vermeer D300x500 directional borer was capable of installing this pipe in the prevailing ground conditions. A 1,524 mm diameter hole was required for installing the pipe, which was close to the limits of the HDD rig.

Apart from the difficult ground conditions (alluvial clay, sand, gravel and sandstone), further challenges included several flood events during the project; and the difficult site access, with a narrow 10 m wide construction corridor over 1.2 km providing access to the exit point.

A pair of 180 mm pipelines were used to return bore material from the entry to the exit site. A Morooka tracked transporter and 4x4 Barford site dumpers

and 6x6 Moxy dumpers were used for accessing the site, as well as excavators in the 20–40 tonne operating weight class due to poor access and site restrictions.

The pipe was shipped to Australia in 11.8 m lengths, packed in 8x40 foot containers. The containers were decanted in Sydney, transported to site by semi-trailer and stockpiled there for later welding. KenKar was responsible for the butt fusion welding of the pipe, as well as the supply and fitting of 81 mm steel test plates to the end of the pipe string for pre-installation hydrostatic pressure testing. Upon completion of the welding, the pipe string was pressure tested to 1,600 kPa to prove the integrity of the welding process. The pipe string was pressure tested again after installation into the HDD bore. The butt fusion welding was carried out in accordance with European Standards as per the recommendations of the pipe manufacturer, as the local →



Foggy conditions didn't hamper progress.

welding standard did not cover pipes of this wall thickness.

Drilling works commenced from the high side of the bore, as this area had the best access and allowed pipe to be strung out on the exit side during reaming operations. Reaming of the borehole was planned to step up in increments suited to the Vermeer and the prevailing geology with a final cut of 60" planned. At completion of the pilot bore, a forward reaming pass was completed to allow the drill pipe to be pushed out for use as a tail string followed by back reaming stages. Difficulty was experienced half way through the 54" pass after significant groundwater infiltration, gravel and cobble ground conditions were encountered. A second drill rig was utilised to seesaw the drill string to successfully complete the remaining reaming and swabbing passes prior to pipe pull. Upon successful conditioning of the borehole, the drill string and pulling assembly was attached to the pipe ready for pullback. In order to meet the client's exacting requirements, the pipe was filled with water during pullback from the already installed and tested main, enabling accurate buoyancy control with fresh water.



Pipe strung out, ready to be installed.

UEA worked closely with drilling fluid supplier Baroid in choosing and monitoring the bentonite-based fluids used for the bore. A centrifuge of a size normally used in downhole oil well drilling was utilised to extract the bore cuttings, allowing 100 per cent of recovered material to be beneficially re-used on site rather than being transported from site for disposal. Given the difficult access, this provided a significant environmental and cost benefit.

Highside Drilling Services supplied both bore tracking services and assisted in calculations for the bore. Wire line steering tool technology was used to



Installation commences.

ensure that the bend radius for the pipe remained within manufacturer tolerances and that the pipe was installed within the narrow pipeline easement.

Despite the many challenges, UEA completed the bore successfully in early June 2011. The milestone in installing 1,200 mm SDR11 PN16 HDPE pipe via HDD has led to inquiries from other water authorities, and is causing a rethink in the industry about what can be achieved with HDD methods, which provide significant environmental benefits from reduced ground disturbance over traditional open cut methods. [i](#)



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