Upper South Creek AWRC – Pipeline Project

OIL/GAS | SEWER | STORMWATER | POWER | WATER | TELCO | **TREATED WATER** | **BRINE WATER**

PROJECT OVERVIEW

UEA was engaged by John Holland as Sydney's leading Maxi Rig HDD Contractor to complete a series of bores on both the Treated Water and Brine Water pipeline portions of the Upper South Creek Advance Water Recycling Centre (AWRC) on behalf of Sydney Water. AWRC is Sydney Water's largest infrastructure investment in Western Sydney and will process wastewater from an estimated 400,000 people expected to dwell in the catchment area over the coming decades. UEA was awarded a total of nine HDDs on the project due to their scale, complexity and criticality.

LOCATION
Western Sydney NSW

CLIENT
John Holland

PIPE
DN1000 PN20, DN900 PN20, DN450 PN20, DN400 PN20

GEOLOGY
Clay, shale & Sydney sandstone

LENGTH
280m – 720m

TECHNIQUE
HDD

SCOPE OF WORKS

UEA's involvement in the project began in the preliminary tender stage, proposing alterations to the initial package to convert three micro tunnels under Badgerys Creek, Jerrys Creek and the Nepean River to HDDs, reducing project risk and accelerating delivery. UEA worked closely with John Holland throughout the delivery of the project, adjusting and fine-tuning bore designs, drilling methodologies, drilling equipment and layouts to ensure a speedy and smooth delivery of each underbore. HDD was selected as the preferred method of pipe installation for many portions across the project due to its cost efficiency, speedy timeframes, flexibility, risk mitigation factors and the general safety of the HDD process.

The pipeline project was broken into two portions based on the pipeline class - Treated Water (TW) and Brine Water (BW). Each originated at the Upper South Creek AWRC in Kemps Creek, with the TW pipeline running west to Wallacia where the TW would be fed into the Nepean River to maintain environmental flows, and the BW pipeline running east to Lansdowne where it would feed into the existing sewerage transfer main.

The TW pipeline HDDs consisted of four significant HDDs of either DN1000 or DN900 PN20 pipe, all crossing waterbodies and all awarded to UEA. The scale of these HDDs required bores of significant size – up to 49"

(1.244m) in diameter – creating substantial risks due to the potential of borehole collapse in the overlying clay and shale ground conditions. UEA developed detailed drilling methodologies and drilling fluid plans to ensure the bores remained well supported throughout hole opening activities and were left open for the smallest amount of time. These HDDs were:

- 598m of DN1000 PN20 under Badgerys Creek
- 321m of DN1000 PN20 under Farm Dam
- 302m of DN900 PN20 under Jerrys Creek
- 398m of DN900 under the Nepean River

UEA commenced drilling on the TW pipeline in early October 2024 and had three of the four HDDs (Badgerys Creek, Farm Dam and Jerrys Creek) installed before the Christmas shutdown – a significant milestone for the project. UEA's HDD expertise, vast fleet of HDD maxi rigs and ability to operate over three maxi rigs concurrently secured the award and ensured the successful delivery of these HDDs.

UEA was awarded five HDDs on the BW pipeline due to their size, complexity, risk, program criticality and need for advanced drilling techniques and processes. These HDDs were:

- 288m of DN450 PN20 across the M7 Motorway
- 498m of DN450 PN20 across Cowpasture Road
- 160m of DN450 PN20 across Green Valley Creek
- 271m of DN400 PN20 across Sydney Trains and ARTC Cabramatta rail corridor
- 736m of DN450 PN20 across the Hume Hwy, Prospect Creek and Henry Lawson Drive

As the BW pipeline traversed through residential and built-up areas requiring both partial and full road closures, several of the bores had very narrow windows in which they could be completed to ensure works had minimal impact on the surrounding community. UEA worked closely with John Holland, modifying HDD sequencing and mobilising multiple crews to ensure these bores could be completed within the allowed timeframes.

Across the entire project, UEA mobilised its entire fleet of five Maxi HDD rigs – Vermeer D300 and D330, Galagher 660 and two Herrenknecht 250C – along with our Vermeer D100 Midi rig, four of our five mud pumps and all six drill fluid cleaning/recycling systems. Along with the drilling and installation of the product pipes, UEA also completed design analysis and verification of all HDDs, service location verification and casing installation, welded and strung all HDPE pipes, handled all pipes during pullback operations, provided temporary works designs, disposed of all drilling fluids and cuttings and swabbed and pressured tested all installed pipework.

MICRO TUNNEL REDESIGNS – NEPEAN RIVER

As previously mentioned, UEA was engaged early on in the tender stage to provide HDD expertise and feasibility studies on installing several portions of the pipeline via HDD rather than the then designed micro tunnels. Micro tunnelling requires shafts to be dug to the invert of the pipeline at each end of the trenchless section to allow the launch and receival of the tunnelling head.

In the case of the proposed Nepean River micro tunnel, shafts as deep as 28 metres were required to be dug through soft alluvial soils between 10-16 metres deep followed by medium-high strength siltstone and sandstone. These shafts would require significant supporting and bracing structures to ensure their stability through the upper alluvial layers whilst maintaining room for the operating of the micro tunnelling

equipment. Further to this, the launch and receival locations of this micro tunnel were within a 1 in 5 and 1 in 20 chance of flooding in any respective year, with flooding occurring in the area five times in the previous three years, and three of these floods occurring the year preceding construction. This posed incredible risk to the micro tunnels as the shafts needed protection of the additional water loading and ingress of floodwaters.

UEA assessed the conditions of the site along with the 'bigger' picture of the overall pipeline, and was not only able to confirm the suitability of HDD for the crossing of the Nepean River but also offered redesigns of the extended pipeline section to cross the Nepean River at an angle rather than perpendicular. This resulted in crossing both the Nepean River and Silverdale Road within the one HDD, removing the need for a second micro tunnel under Silverdale Road.

The resulting change of the Nepean River micro tunnel to HDD not only offered substantial project schedule reductions, but also significantly reduced project and safety risks by being able to complete the entire crossing outside of high flood risk periods.

COMMITMENT TO CONTINUED SAFETY IMPROVEMENTS

A major safety milestone achieved on the project was the installation of a PME500 Rated Capacity Controller/Load Management System to our Case CX350C 35t excavator. This module provides the machine operator with 'load on hook' data prior to lifting, live load data and automatic height, reach and slew monitoring and restriction.

Across the TW pipeline, UEA was tasked with the lifting and handling of larger diameter HDPE pipes approaching 4 tonnes per 13.5m length. While possible to lift these pipes safely within the existing load chart of our 35t excavator, UEA elected to install the PME500 module to ensure the limits of the equipment could not be breached and the safety of our operators, dogman and HDPE welding technicians remained uncompromised.

CHALLENGES

- Urban areas and narrow construction boundaries reduced the available room for site equipment and setups. UEA's vast array of HDD rigs and support equipment was carefully allocated for each bore based on its restrictions. Further to this:
    - On several occasions the only suitable HDPE welding locations were on the rig side, requiring HDD rigs to be relocated to the exit location for pipe installation.
    - A majority of bores required several tie-in or 'golden' welds during pipe installation due to the limited room available, extending pipe installation activities out to up to three days.
    - HDD receival locations were often within roadways and public spaces, making long term receival side setups impossible. Forward reamer was utilised heavily on the project to minimise time required at receival side.
- Remote locations required water to be carted to site.
- Work within tight timeframes for bore delivery.
- Hard rock was encountered on the Hume Highway, requiring a change of tooling and drilling methodology. UEA stocks a range of tooling as contingency for such circumstances, ensuring we are prepared for most situations.

- A drilled in gas main at Cowpasture Road could not be located at the designed crossing location. UEA redesigned the HDD to remain within the approved construction boundary whilst crossing the gas main in a known location.
- Fluid displacement management was a major challenge whilst installing the larger diameter pipes with some bores displacing over 450m^3 of drill mud. UEA worked with local disposal facilities, providing notice of the installation dates to ensure they had adequate capacity to receive incoming fluids.

KEY PROJECT HIGHLIGHTS

- ✓ Successful installation of all bores to Sydney Water Specification.
- ✓ Innovative methodologies to suit the varied conditions of each site.
- ✓ Regular use of forward reaming techniques to minimise construction impact to the surrounding communities.
- ✓ Installation of three of the four TW HDDs within three months before Christmas.
- ✓ Successful redesign of micro tunnels to accelerate project program and reduce project risk.