

North Essex Water Abstraction Source

new borehole to supply 4.25Ml/d to drought stricken Essex

by
Amanda Hedge

The county of Essex is one of the driest in the UK, typically receiving half the national average of rainfall. It is also widely anticipated that the region will be a significant growth area for homes and businesses. The combination of these factors means that continuing to meet the demand for potable water within the county is especially challenging for Essex & Suffolk Water – a division of Northumbrian Water Group. Additional raw water sources are constantly being sought but, until an unused abstraction licence became available from a private malting company, new ground water resource development had never been a viable option. The Environment Agency was not granting any new licences in Essex or most of Suffolk and the last one for ESW was 70 years ago. So, capitalising on this newly available potential ESW carried out extensive investigations to identify a site that was viable in terms of both yield and suitability for construction.



North Essex: Headworks of the New Borehole to supply 4.25Ml/d

Photo courtesy Essex & Suffolk Water

Site

The original plan was to construct an Aquifer Storage and Recovery System (ASR); this option was dismissed on regulatory water quality and cost grounds.

An area north of Roman River was identified as having the potential to meet these criteria, and the site eventually chosen was within the Ministry of Defence (MOD) estate and in close proximity to a strategic main transferring River Stour water from Stratford St Mary in Suffolk to Abberton Reservoir.

In order to commence site activities, ESW commissioned a geophysical survey to determine the presence of unexploded ordnance and secured a lease agreement with the MOD. An observation and production bore were augured to the respective depths of 117.5 metres and 118.2 metres. Test pumping and monitoring ensued to determine the yield of the local chalk aquifer and the sustainability of abstraction.

Data collected from these trials proved that there would be no adverse affect and provided the basis of negotiations with the

Environment Agency for transferral of the recently acquired abstraction licence,

Permission was granted to ESW in 2004, securing an additional raw water resource of 702.4 Ml/yr with a maximum daily abstraction of 4.25Ml.

Site constraints/complexities

The chosen site had a number of key physical constraints and interfaces:-

- * close liaison with the MOD would be necessary to ensure that neither their operations, or conversely the construction programme would be compromised;
- * provision for site power and mains connection were included in the lease agreement, however, the formal notification procedure of a Section 159 (Water Industry Act 1991 - *powers to lay pipes in other land* - would not be an option as The Crown is exempt from all statutory powers;
- * the land around the leased site is tenanted by a farmer whose cattle graze there;

- * West side of the site is bounded by a Site of Special Scientific Interest - which is important from an environmental perspective;
- * the site is one of only a few sizeable remaining areas of unimproved acid grasslands in Essex. English Nature was consulted on the design proposals;
- * proximity to power supply was also an issue; the closest source being approximately 750 metres from the site. Overhead lines required up-rating and a power cable laid from the pole to the pad mounted transformer on site;
- * from a Health & Safety perspective, geophysical surveys were required for the cable and connection pipeline routes. ESW took the additional precaution of commissioning an explosives engineer to brief the site personnel. Examples of ordnance that had been found elsewhere were shown and the dangers explained;
- * planning conditions were imposed under the terms of the lease agreement as well as the District Planning Authority; these took account of the policies of the Adopted Review Colchester Borough Local Plan: B/ENV 40 and Colchester Borough Local Plan 2nd Deposit Draft: CO2.

Design

Mowlem plc was awarded a Professional Services Contract (PSC) for the design phase. In-house expertise was utilised to contribute towards some elements of design, such as pipework configuration and the operating regime.

In the early stages of design the connecting pipeline route had not been established. English Nature had agreed in principle to the method of open cut within the SSSI, provided that the original grassland and spring line was maintained. A small section of hedgerow on the boundary of this potential route was subsequently removed prior to the nesting bird period, to ensure that the option remained viable; to be reinstated upon completion with native hedgerow species.

The alternative option was to directional drill beneath a small area of wooded scrubland. This was a more direct route and once the considerations of environment, reinstatement methodology and associated cost with the original option had been taken into account, **this was the option chosen.**

Construction

Having successfully tendered for the AMP4 Major Civils Framework Agreement, *Mowlem plc* was appointed Principal Contractor for the construction phase of the project, under the terms of an ECC Option A contract (Fixed cost). ESW's Distribution Department was awarded separate Engineering Construction Short Contracts (ECSC); Fixed Price for the pipeline connection and cable route trench work.

Deliverables - Civils

To comply with planning conditions the MCC building was constructed from block-work with an external finish of feather edged timber boarding coated with black tar varnish. The roof was clad in clay pantiles, samples of which were approved by the Planning Authority prior to procurement. A concrete plinth and bund was constructed to house the pad mounted transformer and contain any potential oil spillage

A Glass Reinforced Plastic (GRP) enclosure was erected on a reinforced concrete plinth to house the borehole, headwork pipe work and separate sampling kiosk. A non standard green-brown colour was chosen to blend in with the surrounding natural environment. Hard standing for two vehicles plus provision for a mobile crane (to remove the pump for maintenance/replacement)

was constructed in concrete.

To comply with company wide security specifications a 1.8 metre high palisade fence with double gates for access was erected around the site perimeter. A hedgerow screen comprising of a selection of native local species (Hawthorn, Blackthorn, English Oak saplings Hazel and Holly) was planted within the compound along the fence line. The ground is being left to re-vegetate naturally in the hope that unusual species from the surrounding area will seed on the site. This approach has the added benefit of reduced maintenance, as the grass will only require cutting once a year.

Connection

There were two parallel mains for consideration in terms of the connection point. The main closest to the site was bi-directional, so it was necessary to cross above this and tie in the other by means of under-pressure tapping. This element of the work was undertaken in-house to save cost and place the responsibility with ESW for the integrity of the existing network. A hydrant with connection for a lay-flat hose was installed just upstream from this point, negating the need for a permanent run-to-waste pipeline.

ESW managed the trenching work for the power cable with the attendance of an explosives engineer. This was to reduce cost and minimise the lead-in time with the electricity supplier. A Trencher was utilised for this work to minimise disturbance of the verge since it lies directly adjacent to the SSSI.

Process/Mechanical

A 15kW output Variable Speed Drive (VSD) pump was installed at 35mgl. This was sized for a nominal flow rate of 2.75Ml/d. At this rate, the annual abstraction quantity would be achieved in just under nine months, allowing time for any essential maintenance or replacement of components. The riser comprises of 3 metre sections of coated stainless steel pipe, for ease of removal.

Incorporated within the bespoke borehole head-plate is a dip tube and hydrostatic level transmitter which, upon detection of low water level within the borehole, sends a signal to stop the pump. An electromagnetic flow meter was installed within a concrete chamber. Both instantaneous and cumulative flows are recorded. Once the abstraction licence is met the pump is stopped.

Telemetry

Telemetry signals are transmitted back to the Supervisory Control & Data Acquisition (SCADA) system via a radio link from the site to an Instem outstation at a near-by raw water pumping station.

The final link is a hard-wired cable. The transmitter aerial was installed in the loft space of the MCC building at the borehole site. The pump can be stopped and started remotely from SCADA unless it has failed.

The project was commissioned in 2005 and demonstrated a successful collaboration between the Framework Contractor and the Investment Delivery, Water Resources Planning, Network Control, and North Essex Production Departments (End User) of Essex & Suffolk Water.

Summary

Essex & Suffolk Water has completed the development of this new borehole water abstraction source within the Roman River Valley, south of Colchester. The site started out as a greenfield development but now houses a borehole pump capable of conveying up to 4.25Ml/d of raw water to Abberton Reservoir.■

Note: *The author of this article, Amanda Hedge, is Project Manager, Essex & Suffolk Water.*