Thirsk/Northallerton Supply Strategy

improving supply to 13,000 properties over 700 sq kms

by
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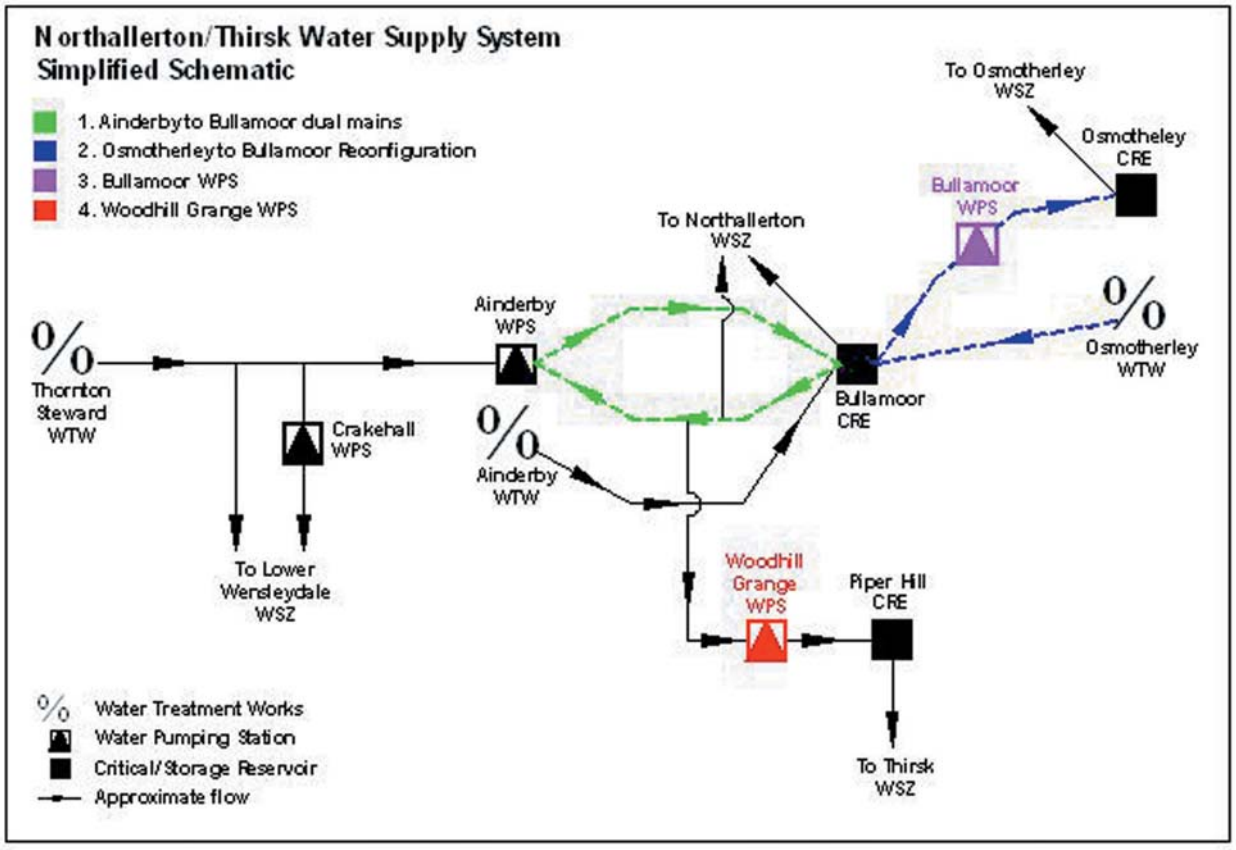
Northallerton Water Supply System encompasses supply to the water supply zones of Northallerton, Lower Wensleydale, Thirsk, Osmotherly and Boltby. Water is transmitted to approximately 13,000 properties (30,000 inhabitants) spanning approximately 700 square kilometres; the population is subject to seasonal increases due to tourism. Yorkshire Water Services confirmed that investigations should be conducted in order to assess remedial and improvement works for a range of potential problems.



The water supply has, historically, been typical to rural areas; with multiple spring sources and boreholes forming a complex network of 'standalone' systems. The area has been subject to vast improvement works within the distribution and transmission mains network over recent years. These works have been primarily conducted under the Section 19 Undertaking for improvement of conveyed water quality.

Section 19 Level 3 Investigation Studies conducted highlighted the necessity to rehabilitate sections of the transmission mains network. However, the general policy adopted for the Section 19 Undertaking improvements involves renovation of the existing water supply network on a 'like for like' basis.

In addition, the area was subject to investigation regarding the general mode of operation and supply. Source water in the Yorkshire Dales is generally variable, requiring intensive treatment. The variable source water and increasing demand necessitated improvement of the water supply system.

Primary source for the area is Thornton Steward, which provides a consistent water source, has a design output of 23tcmd thus becoming the focus for supply to the surrounding area. Bullamoor is the central critical supply reservoir for the surrounding area and associated sources. The optimum supply deemed to blend water at Bullamore reservoir for transmission throughout the surrounding area, maximising the output of source waters and compensating for variation. In order to facilitate the supply strategy, the existing transmission mains network and associated above ground assets required a degree of improvement.

Hence, the proposals were combined, providing a solution with regard to water quality and optimisation of the water supply system.

Proposals

Main enhancement to the existing water supply system was required on a section of 350mm DI main between Ainderby Steeple and Bullamoor. Current operation of the main is bi-directional, allowing transfer of water to Bullamoor CRE reservoir, dictated by level; sufficient top water levels result in flow reversal, with water gravitating towards Ainderby. The main currently also supplies a number of Distribution Management Areas, receiving a combination of water pumped from Thornton Steward and

gravitated water from Bullamoor reservoir. The Water Supply Strategy involved an independent transmission network, thus optimising operation and bulk water transfer.

Extensive network modelling was conducted in order to maximise current assets and highlight areas necessitating improvement. The enhancements also require intermediate pumping stations to allow water transfer between storage capacities throughout the area.

The aforementioned 350mm DI from Ainderby Steeple to Bullamoor reservoir was deemed to be insufficient to cope with forecasted demand. The main was also targeted for renovation under the Section 19 Undertaking. Further investigations suggested the existing main to be susceptible to structural failure. The burst history, coupled with a programme of ultrasonic structural tests confirmed that the main should be replaced.

The amalgamation of the projects would enable all criteria to be met in a more controlled and efficient manner. Site surveys and detailed discussion finalised a solution to provide two new 400mm internal diameter mains between Ainderby Steeple and Bullamoor Reservoir; one being used as a transmission main and the other as a direct transfer main. However, connectivity was considered in order to enable increased flexibility, allowing both mains to facilitate transfer or supply, dependant upon operational needs. The use of Bullamoor Reservoir as a critical blending reservoir also required similar transfer/supply mains from Osmotherley. However, the existing network will facilitate any changes. New pumping facilities are required to transfer water from Bullamore to the Osmotherly area and also the Thirsk area.

Design & Construction

The construction element was conducted in four phases (see schematic). The improvement works were separated into 'above ground assets' and below ground assets' to be constructed by *Earth Tech Morrison* and *Laing O'Rourke* respectively. The installation of new water pumping stations and associated mains re-configuration were relatively innocuous in comparison with the installation of 14kms of 400mm internal diameter trunk main.

The conceptual design identified that both mains were to be installed within the same excavation, hence reducing excavation costs, land compensation and easements, general disruption etc. The preferred route incurred potential difficulties, crossing Spital Beck, two railway lines (including East Coast main line), land drains and also archaeological sites.

Watercourse and rail crossings are generally approached in a similar fashion. Investigatory 'core' samples are conducted on either side of a proposed crossing, enabling determination of ground conditions and thus preferred technique; the results facilitating calculation of optimum depth and likely settlement where required.

The technique employed was 'Auger-Boring, which essentially limits the amount of settlement and possible 'heave' that other techniques may incur. Extensive discussion and consultation was essential in order to gain access and permission, particularly for rail crossings. Method statements, risk assessments and timeline of works are paramount in obtaining suitable possession orders for works within the vicinity of railway lines.

Land drain surveys were conducted prior to construction. because they are common problems in utilities work. The exact location of land drainage is often unknown until excavated. Specialist land survey by *ADAS* confirmed the approximate extent of land drains and estimated cost for repairs/diversion where necessary, although disruption to any drainage is largely unavoidable.

Archaeology

The extent of archaeological presence in the area was largely unknown. Archaeological specialists Northern Archaeology were consulted, highlighting known areas of archaeological history and providing a watching brief for duration of the works. Construction work confirmed the presence of unknown archaeological sites; findings included burial sites and Roman farmsteads. Approximately thirty skeletons were uncovered, thought to be Anglo-Saxon remains circa 800AD. There are believed to be up to 100 skeletons in-situ, undisturbed following low disruption directional drilling installation techniques. The uncovered skeletons were removed and are to be re-buried at a local church, where a service is to be conducted.

Focus groups were formed for the project, targeting potential efficiencies. The pipeline was constructed in polyethylene, allowing welding teams to prepare in advance of main-laying teams; further enhanced by the use of 18m pipe lengths (standard 6m or 12m), which reduced welding and deliveries. In addition, new valves and fittings were trialled, in view of overall cost saving. Cost savings equating were also achieved by utilising the main prior to installation as bypass for a project linked to the Thirsk/Northallerton Water Supply Strategy, although primarily driven by water quality

Generally, the project has been an outstanding success, Potential problems were mitigated by pro-active planning and the use of alternative methodologies promoted cost benefits for all interested parties. Disruption and interruption to supply have been minimised and public relations enhanced. where a project of such magnitude often has a detrimental effect. The diversiy of the project necessitated multi-contractor activity which was managed effectively through effective communication and planning. The project management, planning and utilisation of alternative methodologies shall precedent other projects of a similar nature. ■

Note: *The author of this article, Paul Stockhill, is Investigations Manager, Laing O'Rourke.*