

Shaftesbury Distribution Project

strong partnering ensures efficient delivery of a water supply scheme to satisfy the future growth of Shaftesbury

by Andrew Palmer MEng, CEng MICE, James Findlay BEng (Hons), CEng & Jamie Prichard BEng (Hons), CEng

Shaftesbury is a small market town in Dorset, situated 20 miles west of Salisbury with a population of approximately 7,000 people. The majority of its water is provided by Fonthill Bishop Water Treatment Works, with most entering distribution via Littledown Service Reservoir (SR) which is located north of the town centre. Littledown SR was reconstructed in 2008 and now has a capacity of 1.5MI. It distributes direct into supply by gravity, as well as making use of booster stations and an intermediary, single cell 0.75MI service reservoir at Ivy Cross. However, the location of Littledown SR has for some time increasingly become less ideal as the town expanded both northwards towards the SR and up onto higher ground. As the distribution network continually expanded to meet the town's ever growing demand for water, the issues of low pressure in specific areas were being compounded and the ability to meet minimum standards of service for future developments was not guaranteed.



View of a section of the Shaftesbury Distribution construction site - Courtesy of Lewis Civil Engineering Ltd

Introduction

The Local Area Plan had previously identified Shaftesbury as a "town for major growth" and a 27.8ha area has been set aside for future housing, community, commercial, and employment uses on the south-eastern side. Although 680 dwellings are initially proposed, this is likely to increase in accordance with the Government's PPG3 Planning Policy for Housing Densities.

The principle objectives of the scheme therefore were to enable the supply of future large scale developments to the south-east without impacting on existing standards of service to existing customers and to enable the Ivy Cross SR to be taken out of service for cleaning without the need for temporary network accommodation works. Opportunities also existed for the improvement of leakage management and the potential to resolve some existing low pressure problems.

Workstreams

Wessex Water is recognised by Ofwat as one of the most efficient water and sewerage companies in England and Wales. In order to sustain its success, the company has created framework contracts, 'workstreams', to assist in the delivery of its AMP5 capital investment programmes of work.

These workstreams consist of staff from its own internal engineering and construction group, external consultants, plus external civil and M&E contractors. By engaging with high performing consultants and contractors, Wessex Water intends to further improve the efficiency of its project delivery process through; (i) collaborative early stage involvement; (ii) the maximisation of team working principles; (iii) rigorous planning; and (iv) robust project management. It is Wessex Water's intension to extend the services of the best performing workstreams into AMP6.

Wessex Water assigned the Shaftesbury Distribution Project to its Network 1 workstream in April 2010 with a completion date of December 2011. The Network 1 workstream consists Mouchel, Lewis Civil Engineering Ltd and May Gurney.

Design

Mouchel started design following the high level appraisal stage and was responsible for optioneering, outline, detailed design along with designer support throughout the construction stages.

The design was primarily driven by the need to provide adequate hydraulic capacity for a large new residential and light industrial development on the outskirts of the town. However it was recognised that other aspects of the distribution network could be improved at the same time including; improving leakage detection, resolving low pressure issues, creating operating efficiencies by turning off Barton Hill booster and improving operational flexibility by creating an alternative supply and allowing maintenance without accommodation works. Further engineering value was added by increasing turnover times within Ivy Cross SR, the oldest service reservoir in the whole of Wessex, to improve network resilience to required standards.

The project identified a range of separate solutions to meet all of the design requirements before identifying the most suitable option for each by undertaking complex hydraulic modelling using InfoWorks WS. The preferred option consisted of the following; installation of new cross connections including modifying a reservoir inlet to operate as a pressure sustaining valve, turning off a booster, re-zoning and new meters to improve leakage detection and additional hydraulic capacity to allow temporary bypass of service reservoir for maintenance.

The design has resulted in significant CAPEX benefits by removing the need for a new trunk main and thus significantly reducing the

amount of new pipework being laid and reducing the OPEX for water supply in Shaftesbury by removing a booster station. CAPEX savings in the order of £1m were achieved when compared to the original appraisal level design.

Construction

Following the design philosophy innovation, the physical construction works were reduced in quantity. With the trunk main renewals being removed, the detailed cross connections to facilitate the re-zoning proposal remained as the key elements of work. The value engineered remaining work scope included the installation of 1,800m of 180mm diameter main by both traditional and trenchless techniques installed, tested and chlorinated while the connection works at the reservoir and re-zoning sites were on going. Seven re-zoning cross connections were made in varying diameters throughout the network ranging from 100mm to 450mm diameter, and with flexibility built-in to the design to accommodate any physical constraints determined on site.

In total 1,600 flanges and anchored joints provided the restraint for the cross connection pipe complexes while maintaining this essential flexibility. Excavation areas included heavily urbanised locations on strategic arterial traffic routes within Shaftesbury and rural areas with sensitive environmental constraints. A careful and considerate approach with the local highways team ensured all traffic sensitive works were carried out at night, which provided further benefits as water supply requirements were lower, allowing longer shut periods and less customer interruptions.

Environmentally, badgers and tree protection zones provided the most significant challenges, but by involving the Wessex Water in-house environmental team and engaging with the relevant statutory controlling bodies, construction techniques were developed which gave due consideration to the environment and minimised the impact of the works.

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Mwyndy Cross Industries, Cardiff Road, Pontyclun, Rhondda Cynon Taff,
CF72 8PN, Tel: (01443) 449200
enquiries@lewis-ltd.co.uk www.lewis-ltd.co.uk



Joint commissioning plan

The construction element of the works themselves involved a full understanding of the complex design considerations and philosophy developed through the outline design phase. To facilitate a full discipline understanding of the scheme, Mouchel and Lewis Civil Engineering Ltd developed a joint commissioning plan focused on staging the scheme to minimise customer interruptions and water outages, while maintaining pressures while flow swings and transfers were made.

The scheme was primarily broken down into nine sectors with the philosophy being to identify the parameters which affected customers and stakeholders as well as the physical constraints, and develop the programme accordingly. The collaborative nature of the scheme between Mouchel, Lewis and the Wessex Water Operations team ensured a scheme was developed which allowed these aims to be achieved.

Consideration of the optimum construction techniques were made in tandem with the above, again with the focus being on the technique which would provide the most cost beneficial solution for the client, with consideration to those affected by the works. The traditional contractual complications were overcome by early appointment of the key parties and the all-party buy-in allowed the construction drawings and jointly developed target costs to reflect accurately the likely scheme out-turn cost with a reduced risk profile for the client.

Construction techniques included the installation of under pressure 'tee' and valve installations to minimise shutdowns on strategic mains, pipe bursting, directional drilling and moling for shorter service crossings, as well as traditional open cut solutions where site constraints permitted. Being a multi-discipline contractor with full trenchless capabilities, Lewis CE Ltd was able to offer all forms of replacement in-house and hence offer both the scheme

and Wessex Water the best solution, while avoiding the traditional pitfalls of multi-contractor interfaces. All shutdowns were fully rehearsed with the operations team and with assistance from the public relations department within Wessex Water, construction operations were able to proceed throughout the scheme without complaint from affected residents and businesses.

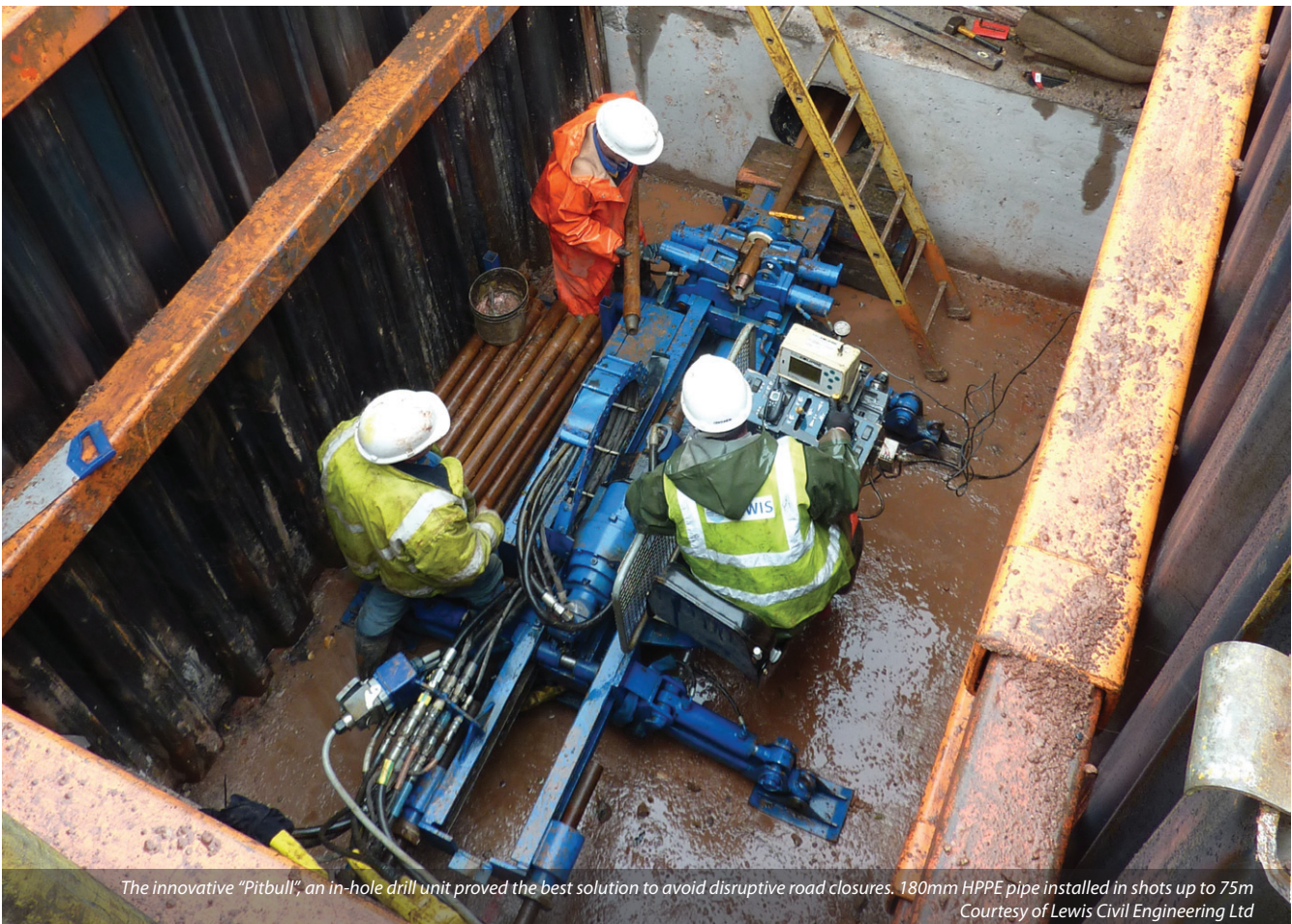
In-house chlorination ability, and a jointly developed strategy with the operations team, allowed shutdown durations to be minimised, further enhancing the perception of Wessex Water and their appointed delivery teams through the project.

The scheme itself capitalising on the full multi-discipline team involvement benefited from developing a reduced scope from an innovative design approach, maximised on construction techniques and solutions and captured the operations teams requirements to deliver a seamless project. With the combined multi-discipline team approach and early involvement, Wessex Water benefited and with an innovative solution through all aspects of delivery.

Conclusion

The success of the Shaftesbury Distribution Project demonstrated at an early stage in AMP5 how collaborative working with external partners could bring significant benefits to the delivery of Wessex Water's capital investment programme. The cost savings on this scheme were in excess of £200k, 25% of the initial budget estimate and on top of the savings made during design. The project was delivered three months ahead of programme and without any environmental or safety issues.

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*The innovative "Pitbull", an in-hole drill unit proved the best solution to avoid disruptive road closures. 180mm HPPE pipe installed in shots up to 75m
Courtesy of Lewis Civil Engineering Ltd*