

Sturminster Marshall to Snowsdown Pipeline

a 9km twin main, and the first section of the Water Supply GRID trunk main to be installed

by Andrew Collier BSc & Ollie Williams BSc

The Water Supply GRID is the largest scheme ever undertaken by Wessex Water. The programme of work comprises a series of projects designed to resolve resilience issues within the water supply network. The GRID will improve interconnectivity within the existing water supply system to enable water to be moved from areas of surplus to areas of need and hence improve resilience to drought and unforeseen events. The Sturminster Marshall to Snowsdown pipeline is the first section of new water supply main to be installed as part of the GRID's trunk main.



Initial intrusion into the River Stour including central island - Courtesy Lewis CE Ltd

Need

The Water Supply GRID is required to enable Wessex Water to meet the following legal and regulatory obligations:

- The legal obligations in the National Environment Programme issued by the Environment Agency, specifically associated with reductions in the amount of water that Wessex Water can abstract from certain underground water sources and rivers from 2018 onwards, as required under the EU Habitats Directive.
- The legally binding undertaking agreed with the Drinking Water Inspectorate, to ensure compliance with Water Supply (Water Quality) Regulations 2000, associated with high levels of nitrates in certain untreated water sources largely from historic agricultural fertiliser usage.
- The regulatory outputs set by Ofwat, associated with the security of water supply to their customers served by a single source of water only.
- The statutory duty to balance the supply of and demand for water up to the year 2035 as set out in the Water Resources Management Plan approved by Defra in 2010.

The Water Supply GRID will therefore allow Wessex Water to meet future demand for water and:

- Improve the security of supply for customers - even in the event of a catastrophic failure.
- Meet reductions in abstraction licenses required by the Environment Agency to improve flows in some rivers and protect their ecology.
- Deal with seasonal or occasional deteriorating raw water quality - particularly increasing concentrations of nitrates at some groundwater sources.

Design and pipeline route

The Sturminster Marshall to Snowsdown pipeline links an existing water treatment works near Sturminster Marshall to an existing Reservoir near Blandford Camp (Snowsdown), a distance of 9km. Both of these sites are also having extensive works carried out in order to enhance their functionality and capacity as part of the Water Supply GRID. The main consists of twin 350mm DI supply pipelines; one is able to operate bi-directionally whilst the other purely transfers water from Sturminster Marshall to Snowsdown.



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you will always get what you always got."*

Albert Einstein



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Cofferdam from opposite bank progresses out to meet island in centre of the River Stour - Courtesy Lewis CE Ltd 22/01/2014 11:18



Lewis CE Ltd pipe laying gang progressing along the easement, the material laid out ahead of them - Courtesy of Wessex Water



Triple pipeline crossing of River Stour within the coffer dam Courtesy Lewis CE Ltd

The route of the pipeline was largely set during the EIA and planning phases of the GRID scheme; this gave the pipeline detailed design team a corridor of 50m through which the main could travel. The route of the pipeline generally runs through chalk ground with some flints; the fields themselves are mostly used as arable land, with a little pasture land. The makeup of the ground played a large role in the selection of ductile iron as the pipeline material.

Following a cost benefit analysis with DI, PE and welded steel it was decided that for the trunk main of the GRID, DI was the most efficient and effective product. The design team also utilised the range of anchored DI pipework available from Saint Gobain PAM UK. This has meant the construction across the fields could progress more smoothly, with concrete thrust blocks only being utilised in positions of choice, saving the need to transport large volumes of concrete along the working strip.

The route required the crossing of the A350 twice, the B3082, the River Stour, its flood plain and a tributary, the River Tarrant and a selection of minor roads, bridleways and footpaths, old railway lines.

Main design challenges - Crossing an arterial route

The A350 and river crossings presented particular challenges for the team to overcome. The A350 is an arterial route within the county, the River Stour is approximately 30m wide and 1m deep, whilst the River Tarrant is approximately 8m wide and 0.8m deep, there were also several points of archaeological interest identified during the early stages of the scheme.

As an arterial route within the county there were tight working restrictions on the A350. In order to achieve the most efficient and effective final solution an approach of open cutting both A350 crossings was adopted. The restrictions directed when there was a window of opportunity during which to carry out this work.

Due to the tight timescales this element of the work was constructed by Trant Construction Ltd whilst they carried out work on a new entrance to Sturminster Marshall WTW.

Crossing the River Stour

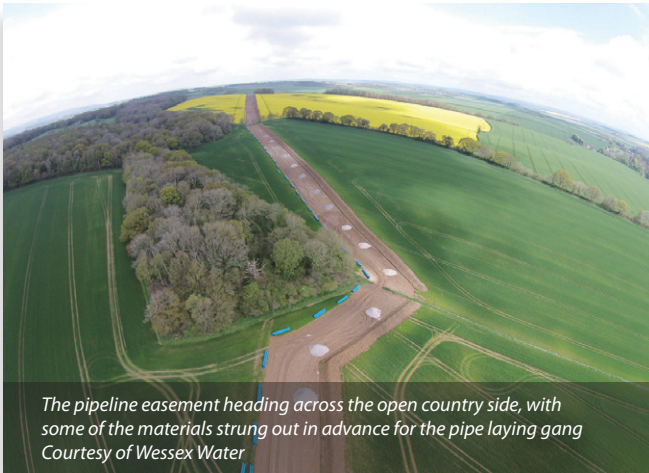
The River Stour was a very complicated point in the design to deal with. Its location relative to a borehole site feeding Sturminster Marshall WTW meant that it sat within a Source Protection Zone.

This in combination with local ground conditions at deeper depths went some way to the decision to not be able to use trenchless technologies to be able to cross the river. The risk of a break out from directional drilling was too great, and the depths and sizes of shafts required in order to be able to install the crossing via auger bore in competent ground were excessive. This led the design team down the route of open cutting the river.

Detailed consultation with the Environment Agency (EA) was critical on this in order to achieve their support and to gain flood defence consent for the works. Lewis Civil Engineering was then able to carry this design forward into construction.

The agreed approach was to set up a coffer dam from one bank extending to just beyond the halfway point, then to construct the pipeline within the cofferdam to just behind the halfway point of the river. This would create a coffer dam 'island' in the middle of the river, before withdrawing to the first bank. Finally to construct a new cofferdam out from the opposite bank to connect with the island again, lay the final half of the pipeline, before withdrawing out of the river completely.

Due to the complicated nature of the install and any further on-going maintenance the crossing was recognised as being a critical crossing. As a result three 350mm DI mains were installed across the



The pipeline easement heading across the open country side, with some of the materials strung out in advance for the pipe laying gang
Courtesy of Wessex Water



Archaeology undertaking an area of targeted archaeological excavation, ahead of the main pipeline being constructed
Courtesy of Wessex Water

river, with a concrete mattress over the to offer protection for the future. The three mains meet on either bank within valve complexes so that the twin mains are able to utilise any of the mains crossing the river.

Crossing the River Tarrant

The River Tarrant was complicated for different reasons; it is a winterbourne river and therefore at times it can appear to run dry, when it is following the same course below ground. The initial intention had been to open cut this river; however its winterbourne nature meant that the EA advised it would be better following a trenchless route for this particular river.

As this crossing was not within the vicinity of any source protection zones, installation of the crossing was carried out by directional drill. For this the twin pipeline again split into a triple crossing. The crossing itself was installed in 450mm PE utilising a 60m long drill.

Archaeology

Prior to the submission of the environmental statement, the design team agreed an archaeological mitigation strategy with the Dorset County Senior Archaeologist which highlighted areas of known archaeology and established areas of high archaeological potential along the route of the trunk main.

The mitigation strategy for the Sturminster Marshall to Snowdown pipeline identified 10 different areas where an archaeological watching brief was required during construction and 1 area where a planned targeted archaeological excavation took place prior to construction commencing.

A strong working relationship between Lewis Civil Engineering and the appointed archaeological contractors, AC Archaeology, was crucial to allow the recording our past whilst achieving our aims for the future. The strong working relationship between Lewis Civil

Engineering and AC Archaeology ensured that the construction of the pipeline continued with minimal disruption to the construction programme despite running through an archaeologically sensitive landscape.

Procurement

Wessex Engineering Construction Services (WECS) is managing the overall delivery of the programme. This element of the project was delivered through Options with outline design by Atkins Ltd.

The detailed design of the pipeline was carried out by the WECS in house design team, with support from AECOM. The advanced construction works were carried out by Trant Construction Ltd, with the construction of the rest of the scheme being carried out by Lewis Civil Engineering Ltd.

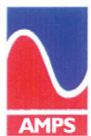
The ductile iron elements of the pipeline were procured through a GRID specific agreement with Saint Gobain PAM UK; the PE pipe for the scheme was procured from GPS and the valves for the scheme were procured from AVK UK. Archaeological work was carried out by AC Archaeology.

Construction programme

Construction of the new pipeline was completed in January 2015. Tight restrictions on when construction works were allowed to take place in the A350 meant that these road crossings were installed prior to the rest of the scheme during Autumn 2014.

The pipeline has been swabbed and pressure tested, and will be fully commissioned when the new works at Sturminster Marshall and Snowdown are also ready to be commissioned.

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