SECTOR TYPE: Water – infrastructure
LOCATION: Lincolnshire
CLIENT: Anglian Water
PRINCIPAL DESIGNER: Mott MacDonald
PRINCIPAL ENGINEER: Mott MacDonald
PRINCIPAL CONTRACTOR: JN Bentley
CONTRACT VALUE: £40 million
CONTRACT DURATION: 33 months

The Project

The Covenham to Boston pipeline is a scheme designed to address the future water needs of Boston, Lincolnshire. There are two key drivers for the scheme – significant population growth, and the need to ensure that customers’ supplies are resilient in the unlikely event of a major problem with the treatment works supplying the area.

As part of its 2010-2015 Asset Management Plan (AMP5), Anglian Water identified the need for a new 27 ML (million litres) per day transfer scheme from Covenham Water Treatment Works (WTW) to Boston, comprising of 15.6 ML/day due to demand growth and 11.4 ML/day to provide resilience. The proposed scheme included of 600mm diameter pipe and an intermediate pumping station.

Anglian Water has set challenging targets for reducing the capital costs by 19%, embodied carbon by 50% and operational carbon emissions by 20%. The project brief aligns with Anglian Water’s ‘Love Every Drop’ campaign, a leadership platform designed to highlight the importance of water in our lives.

In order to deliver the scheme against these demanding targets, extensive optioneering was undertaken using Anglian’s Risk and Value intervention process. The solution selected for implementation includes a 15.6 ML/day pumping station and transfer pipeline from Covenham WTW to Boston. During a resilience event, the balance of 11.6 ML/day will be transferred from the south into Boston, to enable the improvements to existing infrastructure as required.

The collaborative approach undertaken by stakeholders, supported by the Early Contractor Involvement (ECI), resulted in efficiencies as well as carbon and cost reductions.
The Benefits

The delivered scheme meets its defined objectives in terms of cost, programme and carbon targets by:

- **Reduced carbon** – by implementing a stepped pressure rating where the pipeline rating is designed to match the pressure profile reduced material usage, which saves both cost and carbon. The reduced welding time associated with this decrease in wall thickness saves further carbon during construction.

- **Materials** – detailed analysis of various pipe materials and their installation methods highlighted that Polyethylene (PE) offers the overall lowest cost and embodied carbon solution. Transporting in 18m length reduced the number of deliveries by approx. 30%. The flexibility of PE pipe also allows it to follow the natural terrain, avoiding the need for extra joints to accommodate bends or local diversions and minimising the need for thrust blocks.

- **Reuse of materials** – utilising excavated material as backfill along most of the pipeline route and reworking the material for reuse in certain areas (where site investigations indicate that natural material may be unsuitable) reduces the environmental impact of importing and exporting material.

- **Utilising existing assets** – up to 40% of the water will be transferred using the existing supply network. This will reduce the size of the pipelines required from a 600mm diameter to 450mm diameter, as well as the size of the new pumping station. Existing assets utilised in the solution will also be enhanced to improve reliability.

- **Cost** – re-routing the pipeline to design out the intermediate pumping station will save both capital expenditure (CAPEX) costs and additional operating costs.

- **Cost** – developing standard products, for example 60 washouts for 108 air valves along the route has resulted in a forecast CAPEX saving of £450,000 and an embodied carbon reduction of 1770 tonnes.

The Process

The key processes underpinning the project:

- Detailed network modelling and existing asset assessments during the optioneering stage highlighted the opportunity to transfer 40% of the 27Ml/day through existing assets, decreasing the scale of the new infrastructure required.

- Using specialist software to prepare pipeline plans allowed asset information to be stored which the model, which will be handed to the client on completion, will be able to provide as built information in the future.

- The consultant’s ability to offer all required expertise – from structural designers to pipeline and process specialists to ecologists, archaeologists, hydrologists and town planners – ensured that the design, environmental and planning teams were able to work closely to deliver a timely economical submission. ECI brought supply chain management to the forefront of all design decisions and resulted in efficiencies.

- Public exhibitions informed the community early on in the project. Major concerns were dealt with prior to submission of the planning application and environmental statement.

Key Learning Points

- The challenges presented by Anglian Water helped to generate the right culture for exploring how best to meet the cost and carbon targets. This also engendered healthy competition in the design team to actively seek savings whilst forging powerful collaboration between designer, contractor and client. This was further enhanced by Anglian’s desire to develop products.

- ECI was instrumental in obtaining buildable and efficient designs, leading to both cost and carbon savings.

- In preparing the environmental statement and planning submission, a strong collaborative culture between stakeholders – the environmental consultant, contractor, client, Environment Agency, IDB and third parties including Parish Councils and the Local Planning Authorities – was essential in obtaining timely planning permission.

Additional Information

This solution outperforms the financial and carbon targets as shown:

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<thead>
<tr>
<th></th>
<th>CAPEX</th>
<th>Embodied Carbon</th>
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</thead>
<tbody>
<tr>
<td>Traditional Solution</td>
<td>£41.5m</td>
<td>20,723 TC02e</td>
</tr>
<tr>
<td>Target</td>
<td>£33.6m (-19%)</td>
<td>10,361 TC02e (-50%)</td>
</tr>
<tr>
<td>Sustainable Solution</td>
<td>£31.1m (-25%)</td>
<td>8,830 TC02e (-57%)</td>
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End User Feedback

Anglian Water’s Special Project Management Team confirmed:

“The way the team forged a strong working relationship from the start of the project was exemplary in terms of collaboration. They worked within our risk and value intervention process, challenging scope and cost through the optioneering and detailed design stages to realise an efficiency in excess of 19% on cost and a carbon reduction in excess of our 50% target. Of particular note is the way the team formed a strong relationship with our operational colleagues, the ultimate end user.”

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Learn more

www.gpsuk.com/casestudy/1/26/covenham-to-boston.html

For more information on

The Green Construction Board

visit www.greenconstructionboard.org
or email green.board@bis.gsi.gov.uk