Case Study

Heigham, Norwich

Weholite storage tank caters for a projected fivefold increase in potable water demand

SDS Systems
Weholite Water Storage Tank and Manholes.

SDS Customer
Skanska (principal contractor).

Client
Anglian Water.

Project
Heigham Water Treatment Works.

Purpose
To meet a projected fivefold increase in potable water demand by 2034.

Brief to SDS
To provide a water storage facility.

Timing
The scheme took just over two years to complete, entering service in 2019.

Project Background Information
Heigham Water Treatment Works (WTW) has provided the main supply of drinking water, sourced from the River Wensum, to circa 200,000 Norwich residents for over 100 years at an average of 42 million litres per day. Potable water is pumped into the Norwich Public Water Supply Zone feeding a multitude of storage reservoirs, booster pumps and properties.

The main raw water abstraction for the WTW has historically been taken from Costessey Pits, a bankside storage area next to the River Wensum approximately 4 miles distant from Heigham and away from the city, thus providing a more favourable water quality and buffering capacity to manage sudden water quality changes in the river. However, with the population in and around Norwich expected to reach one million by 2034, Costessey Pits was deemed no longer able to store enough water to support the needs of the city without having a detrimental effect on the environment in an area which has been designated a Special Area of Conservation (SAC). Furthermore, Anglian Water would likely fail to comply with the requirements of the 'EU Habitats Directive' and the Environment Agency's

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'Restoring Sustainable Abstractions Programme' which demands a reduction in the volume of water taken from the River Wensum.

Project Objectives

To address the 1 in 6 year risk that Heigham WTW will be unable to supply water for a period of three consecutive days.

Project Requirements

To reduce water abstraction from the River Wensum.

SDS Product Features

To ensure the continued supply of water to the public, a number of solutions were considered including desalination of seawater on the Norfolk coast, indirect reuse of wastewater from Norwich, and the construction of a large new raw water storage reservoir just outside the city. The preferred AMP6 business plan option, however, was to use the existing abstraction point at Heigham WTW, which falls outside of the SAC, to compensate for the reduction in abstraction from the river at Costessey Pits. This solution includes a pumping station and an 8km long, 800mm diameter pumping main to transfer the raw water to Costessey enabling reutilisation of the existing five days' storage capacity; the stored water is then conveyed from the Pits to the WTW via the existing pipeline.

The storage tank comprises separate top and bottom sections, weighing 13 and 10 tonnes respectively, which are constructed from multiple, 12cm thick, Weholite modular panels of up to 4.7 metres in length. The lower section is equipped with additional 6cm thick base plates to provide increased rigidity at the lifting points, whilst HDPE modular lifting eyes that are fitted to the upper section also assist with the tank's installation. Welded box joints further bolster the tank's rigidity and ensure it remains air- and water- tight. A walkway along the top of the tank is equipped with a handrail and emergency escape ladder.

Issues Overcome

To cater for a more challenging raw water quality envelope an alternative solution to upgrade the existing clarification and filtration processes at Heigham WTW has subsequently been developed. Since the final product is the main drinking water supply for the city, a resilient solution was essential. Recognising that the existing works would not have been able to treat poorer quality raw water, the design team established that a new, state-of-the-art, submerged ultrafiltration membrane plant was the solution which best suited the limited footprint available whilst leaving the lowest level of residual risk.

Results

A new building will accommodate the new membrane ultrafiltration system, representing the largest submerged ultrafiltration plant in the UK with the greatest surface area of submerged reinforced membranes in Europe. The new scheme will increase supply to 57 million litres daily, treating 668 litres per second, and deliver a 62% reduction in operational carbon when compared to the original design by no longer requiring water to be pumped from Costessey Pits.

Summary

Taking just over two years to complete, and entering service at the end of 2019, this will represent the largest capital investment project within Anglian Water's portfolio in AMP6, helping to ensure resilience of supply for decades to come, while protecting the local environment around the River Wensum, also a designated Site of Special Scientific Interest.

Paul Naylor, Regional Supply Manager, Anglian Water, said: *"We're planning decades into the future with this investment. This technology is vital to keep pace with the growing city's needs. Norfolk is expected to be home to more than one million people by 2034 and many of those people will be coming to live and work in Norwich. This, combined with being in one of the driest counties in the UK, means that significant investment is needed to ensure we keep taps running and continue to power the economy. As importantly, this scheme will make sure the environment does not suffer because of future growth and is ready to cope with any increased demand on local water resources too."*

Images of membrane building in construction and interior kindly supplied by Anglian Water @one Alliance, courtesy of Matthew Power Photography.