

Hodder Service Reservoir

security of supply project

by
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Hodder Water Treatment Works (WTW) is located within the Forest of Bowland, an Area of Outstanding Natural Beauty (AONB). The works is at the head of the 80 year old Hodder Aqueduct which flows westward to Blackpool some 60 km away. Hodder WTW can supply up to 105MI/d to Blackburn, the Ribble Valley, Preston and the Flyde coast. A new service reservoir was required to improve the security of supply. Hodder service reservoir is a new 17MI facility near Slaidburn, Lancashire and was constructed at a cost of £13.8m. Work on site commenced in October 2007, the reservoir was brought into full operational use in September 2009.



The completed Service Reservoir blends into the landscape of the Forest of Bowland

Courtesy of MWH

The integrated design and construction team comprised MWH as Solution Service Provider, Client United Utilities, and Design Build Contractor KMI+, itself a joint venture of Keir, Murphy and Interserve, supported by detail designers GHALivigunn. All partners operated as a 'virtual' joint venture, sharing the core values of trust, passion and commitment with team working key to the success of this project

Need for Hodder Service Reservoir

A new service reservoir was required to improve the security of supply. Some supply zones are fed directly off the aqueduct and if the works was to fail they would be without water. In addition there is a risk that discoloured water could enter the 75 year old aqueduct as it drained down.

Unlike a normal service reservoir, which balances diurnal fluctuations in demand this new reservoir provides a stored buffer volume of water to maintain supply to customers should the works fail, until such time as the works is restarted or supply zones are transferred to alternative sources of potable water.

In addition Hodder WTW was non compliant on CT (disinfection). A new contact tank was built as a separate 6MI tank, constructed as part of the service reservoir. Coupled with the reservoir volume of 17MI the total stored volume stored at the site is 23MI.

Definition stage design was led by Solution Service Provider MWH, who together with United Utilities determined the location and volume of the service reservoir.

Determining the location of the new Service Reservoir

It was decided to try and locate the reservoir at a level where it could both fill and empty by gravity. This would not only save the estimated

£500k cost of a pumping station but also eliminate associated power and maintenance costs.

Aerial photos with topographical data were used to initially identify a suitable site, which was later subject to a full survey. As the reservoir was to be located in the Forest of Bowland AONB the team reduced the visual impact of the reservoir as far as possible by selecting a site where the reservoir would be partly buried.

Determining the size of Hodder service reservoir

The required volume of the reservoir depended on:

- The time taken to restart Hodder WTW following an emergency shut down;
- The time taken to supply zones from an alternative source;
- The flow through the WTW at the time of shut down.

Failure mode analysis of the works showed that repair and restarting the works would take longer than supplying zones from alternative sources. A cross connection existed between the Haweswater Aqueduct (which supplies Manchester) and the Hodder Aqueduct. Opening this cross connection could supply up to 60MI/d from the Haweswater Aqueduct into the Hodder Aqueduct. The demand on the Hodder Aqueduct could be reduced by closing valves to reduce flow to Blackpool and the Fylde Coast, an area also supplied from Franklaw WTW, which could be ramped up to take up any shortfall in supply.

As Hodder WTW is remote, travel time of operators and engineers is high. Analysis showed that an operative could not be guaranteed to arrive at the works until two hours after the failure alarm, with further network controllers then required to attend remote line valves. This led to an initial sizing of the reservoir at 30MI.



Hodder Service Reservoir is located in the Forest of Bowland AONB



Photo courtesy of KMI+

The key to reducing the size of the reservoir was to install technology that allowed the operators to remotely operate the line valves. This remote access technology allowed operators to use the works SCADA over the internet, without even leaving home, thus eliminating travel time to the works and the remote valve sites.

This reduced the volume of the reservoir from 30MI to 17MI which gave estimated savings of over £3m.

Detail Design

The detail design was led by GHALivigunn with involvement from United Utilities and all parties in the alliance.

United Utilities' asset standard required a 0.5m thick drainage blanket under the structure to deal with groundwater and aid leak detection. The project team challenged this as it required the excavation of an extra 3000m³ of limestone at a depth of 6m and replacement with imported granular material.

United Utilities' asset standard panel agreed to a reduction in the drainage blanket and the base slab was cast in 6 large pours providing a 1.2m wide drainage blanket underneath the joints only. This solution provided a robust system for leak detection, reduced rock excavation and saved £160k and three weeks on the programme.

Environment and Community

The only access to the site was through Slaidburn village, over two listed bridges and along many narrow, quiet lanes. Although Slaidburn is not connected to the mains water supply, Slaidburn residents would have to endure all the construction traffic movements.

Sensitivity to the needs of the local environment and community were thoroughly considered during the planning phase. To mitigate visual impact the reservoir was partly buried, and covered in topsoil before seeding and planting. Landscaped bunds were also formed for further camouflage. The remaining exposed eastern elevation was clad with stone. Over 1500 trees and shrubs such as Blackthorn, Sessile Oak and Downy Birch will be planted around the reservoir.



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Photo courtesy of KMI+

To further reduce costs it was agreed with United Utilities Estates Management Team that they would take surplus excavated rock for use within the Bowland Estate. This was not only a sustainable and cost saving measure; it also eliminated 6000 traffic movements within Slaidburn village. The new access track to the service reservoir and new boundary dry stone walls were also constructed from excavated stone. This track mimicked a farm track typical of the area. Furthermore, the design discounted an alternative access route along the bottom of the Hodder Valley which would have resulted in unacceptable losses of mature trees and potential disturbance to badger setts.

From the final design drawings to planning approval and land purchase took just three months, an exceptional performance for a project of this sensitivity. A number of ecological and landscape concerns were raised during the planning process and quickly addressed to ensure the application proceeded to committee on programme.

Construction

KMI+ started on site in October 2007. Great care was needed to avoid any pollution of the River Hodder, a Class 1 River supporting salmon and trout. A fully linked pumping system was installed using lagoons and settlement tanks to prevent silt laden water from excavations entering the River Hodder.

Commissioning was commenced in June 2009, but could not be completed until September 2009 because refurbishment works on the Hodder Aqueduct prevented peak flow testing.

The project's outstanding environmental performance was recognised in June 2009 when the project was awarded the Construction News Quality Awards Environmental Project award for 2009.

Note: The Editor and Publishers thank Peter T Ratcliffe of MWH, who is working as Senior Design Manager in United Utilities Process Alliance, for providing the above article for publication. ■



The author (right) and members of the Project Team celebrate receiving the Construction News Quality Award for Environmental Project

Courtesy of United Utilities Process Alliance