

River Strule Abstraction Project

challenges faced on the £6m investment to augment the raw water supply to Derg WTW

by Justin Keane

NI Water faces key issues in ensuring security of supply to customers in the face of global climate change, constraints from local agencies, European directives and pollution incidents. The company had already identified the need at Derg WTW in Co. Tyrone to provide a reliable and secure water supply for local consumers and businesses in their Water Resource Strategy. The solution was to augment the existing raw water supply to Derg WTW with an alternative raw water source, namely the River Strule. Derg WTW, located near the village of Ardstraw, lies within the Foyle fisheries and marine resource system, which is regarded as one of the richest fishing areas in Europe and is renowned for salmon, sea trout and brown trout. The Foyle system has been designated as an Area of Special Scientific Interest and a Special Area of Conservation as well as being located on the edge of the Sperrins, an Area of Outstanding Natural Beauty.



The proposed site for the abstraction point on the River Strule highlighting the existing natural weir - Courtesy of Capita

Background

Capable of a throughput of 26.6ML/d, Derg WTW serves a population of approximately 50,000 people sourcing raw water from the adjacent River Derg. Water treatment at this plant involves a series of processes including, flocculation, filtration and disinfection. Treated water is stored on-site in clear water basins from which it is pumped to a number of local service reservoirs serving the large urban areas of Strabane and Omagh as well as outlying rural areas.

The current average daily demand on Derg WTW is 13ML/d, but pressure from population increase and demand through strategic links to provide an integrated water supply network will mean that demands at peak times will require Derg WTW to have the ability to produce potable water operating at its full capacity.

Current abstraction licences, granted by the Northern Ireland Environment Agency (NIEA), permit NI Water to abstract up to 15ML/d from the River Derg. However, studies undertaken as part of this project, identified that the flow in the River Derg was not capable of providing adequate flow throughout the year to secure supply to customers and this would therefore be enhanced by augmenting the raw water supply.

The Water Framework Directive United Kingdom Technical Advisory Group (UKTAG) provides policy guidance on water resource standards that limit the amount of water that can be abstracted from a particular source. This is used to inform the Northern Ireland Environment Agency when assessing applications for abstractions. Analysis of river data showed that at current demand

levels abstraction from the River Derg would breach the UKTAG provisions 11% of the time; with breaches occurring predominately between May and September. Increasing the abstraction levels up to 26.6MI/d would see such breaches increase to approximately 21% of the time, with breaches occurring throughout the year, but predominately between May and September.

However, analysis of data for the River Strule highlighted that at the current permitted abstraction rate of 15MI/d, UKTAG provisions would be breached 0.03% of the time. Increasing the abstraction level up to 26.6MI/d would see such breaches increase to approximately 1.5%; with breaches occurring predominately between June and September.

The solution proposed to augment the raw water supply to Derg WTW through abstraction from the River Strule would invoke virtually no UKTAG failures; however this solution may also mean that there may be very rare occasions when the full 26.6MI/d may not be available from either source. In such exceptional circumstances, where low flow conditions are met in both the River Derg and the River Strule, NI Water would seek exemption, under the Water Framework Directives, in order to maintain the water supply to the population.

Project design

The main issues for consideration when assessing a suitable site for the proposed abstraction was ensuring security of supply, the impact of in-river pollution and the impact construction would have on the local environment.

Two options were considered for the location of the new raw water abstraction – one at the site of the confluence of the Rivers Derg and Strule, the second, a site 3km upstream of the Derg/Strule confluence. Whilst an abstraction point at the confluence would have the benefit of the greater combined flow of the two rivers, in

circumstances where a pollution incident occurred in either river the supply to Derg WTW would be disrupted.

The site 3km upstream of the Derg/Strule confluence was assessed to have the greatest benefits and was chosen due to the benefits of security of supply and a naturally occurring weir which would mitigate the requirement to construct an entirely new weir and thereby reduce the impact of construction on the local environment.

The project scope included:

- Refurbishment of the existing weir in the River Strule.
- Construction of a new abstraction points including a headwall intake incorporating fish screens on the bank of the River Strule together with an in-stream submerged static screen intake constructed under the river bed. The construction of two points of abstraction provided redundancy and therefore provided increased security in the supply of raw water for treatment.
- Construction of a new raw water pumping station (RWPS) including all mechanical and electrical elements, to pump abstracted raw water from the River Strule up to 26.6MI/d.
- Construction of 7km of 500mm diameter pipeline from the proposed RWPS to the existing Derg WTW installed through a mixture of agricultural lands and roads, employing both open-cut and trenchless techniques.
- Connection and integration of the new raw water source into Derg WTW.

A key element of the project success at design stage was the liaison and consultation with the many parties interested in the river and its ecology. Liaison with the many key stakeholders proved to be vital in ensuring a smooth transition through the planning process, whilst close engagement with other local agencies during the design stage ensured applications for abstraction licences



Weir refurbishment in the centre of the river and pedestrian access. Plant access was by a causeway constructed from rock - Courtesy of Capita

and the necessary consents to work within an area designated as environmentally sensitive ran smoothly. Additionally, early engagement and liaison with local landowners and businesses with fishing interests on the River Strule ensured that when construction commenced mitigation measures were in place to protect these interests.

The design stages of the project drew on a wealth of engineering expertise from within Northern Ireland and across the UK.

A regime of water sampling of the River Strule was undertaken for one year with samples being tested in the laboratory to assess the suitability of the water for treating with respect to the current treatment process employed at Derg WTW. Results identified the River Strule water to be more alkaline than water from the River Derg which would require the new process of acid dosing to be added at Derg WTW. However, if blended appropriately, abstracted water from the two sources could be treated and the need for acid dosing reduced.

Design of the refurbishment of the weir involved a detailed hydraulic study of the River Strule. Hydraulic engineers commissioned a survey of the river bed which enabled a detailed theoretical model of the river system to be constructed. The model was used to assess the impact that the proposed refurbished weir would have on the environs of the River Strule and the potential to increase the flood risk to the local area.

This study reviewed the impact of the weir further upstream and concluded there was negligible effect with modelled floodwaters seeing approximately a 25mm rise in level in a 1 in 100 year flood event. The potential rise in floodwater levels was determined as not to affect any properties within the town as it was confined to adjacent agricultural land.

Similarly, there were a number of structural engineering challenges. The raw water pumping station, to comply with planning conditions, had to be constructed at a level above the predicted 1 in 100 year flood level. However, to ensure ability to abstract from the river successfully, a 15m deep wet well was required, coupled with designing a building to be built on soft alluvium river deposits.

Procurement

Based on the anticipated value of the contract, under European procurement procedures, the project was advertised in the Official Journal of the European Union (OJEU) in February 2011 and invited expressions of interest to tender for the scheme. In total 7 applicants were successful in progressing from the Pre-Qualification Questionnaire (PQQ) stage to Tender stage. All successful applicants were construction companies based throughout the island of Ireland.

The project was let as a build only project with some limited Contractor led detailed design elements. The project used the NEC 3 Engineering and Construction Contract Option A. The project was awarded to the successful tenderer, Farrans Construction Limited, following assessment of tenders using a price and quality ratio. The contract was awarded in February 2012.

Construction

The programme for construction was twelve months, with construction due to be completed in March 2013. However, unexpected ground conditions at the site of the RWPS, including the soft alluvium deposits and rock, which had a greater hardness factor than expected, extended the contract period by some 4 months.

Continued liaison with key stakeholders was crucial to the process and ensuring consents were in place to allow work to take place in the River Strule. Collaborative management and on-site supervision



Pump hall: Showing 3 (No.) high duty transfer pumps
Courtesy of Capita



The 'finished product': The River Strule and refurbished weir in the foreground and RWPS building in the background - Courtesy of Capita

of the Contractor's proposed construction methods was required to ensure compliance with pollution guidance due to the sensitivity and nature of the work being undertaken. The Contractor also employed an early warning river monitoring system, whilst undertaking in-river works, to identify any pollution incidents and protect local fishery businesses downstream, which rely on the River Strule. However, due to pragmatic planning of the work and measures such as the use of biodegradable oils in plant meant that no pollution incidents were noted during the construction works.

Construction of the pipeline also included a crossing of the River Derg, the A5 arterial road between Omagh and Londonderry and an earth bund containing badger setts. All these crossings were carried out using directional drilling techniques and therefore incurred little or no disruption to the local environment and road users.

Conclusion

The success of this project showcased the quality and capabilities of local companies to work together to overcome the challenges presented in delivering the River Strule Abstraction Project.

The augmentation of raw water supplies to Derg WTW will bring many benefits to NI Water customers. It will ensure future compliance with water quality regulations and reduce the risk of plant down time due to pollution incidents.

The increased operational reliability and flexibility enable operators to select water from either source or a combination of both will ensure social and economic development whilst operating in a sensitive manner within our environment.

The Editor & Publishers would like to thank Justin Keane, Project Manager with Capita, for providing the above article for publication.