Sulby WTW

major investment improves IOM water treatment infrastructure

As part of a major capital expenditure programme,, the Isle of Man Water Authority is currently upgrading its treatment and network facilities. Replacement of five small ageing water treatment works with two modern works forms a significant portion of that expenditure. The recently completed Sulby WTW, serving the North and West of the Island, will be followed by the new Douglas WTW, currently under construction to serve the South and East of the Island including its capital, Douglas.

Sulby IOM WTW: Primary Filter Gallery *courtesy Sulby WtW Team*

Background

The Isle of Man is a self governing Crown dependency which, through its ancient parliament, Tynwald, has a considerable domestic legislative and political autonomy. The Water Authority is a statutory Board charged with ensuring that the Island's requirements for potable water are supplied, both economically and efficiently. The population of the Island is over 76,000, which peaks annually to around 120,000 during the TT race fortnight.

The Island benefits from a special relationship with the European Union and the new WTW were designed and have been/are being constructed in accordance with latest EC legislation and DWI directives, current best practice in the UK having been adopted.

The Isle of Man operates its own employment laws and work permits are required. There is also a requirement to use contractors and sub-contractors who are registered on the IOM Government's List of Approved Contractors and the Scheme for the Certification of Craftsmen.

The scheme

In the mid-nineties, faced with an increasing population and flourishing economy the Water Authority recognised that its existing infrastructure could not cope with increasing demand and ever tightening water quality requirements.

Following a series of strategic and optioneering studies carried out by WRC and MWH, the Water Authority gained Government approval in 1999 to procure two new treatment works on a design and construct basis under an IChemE "Red Book" lump sum contract.

After a tendering exercise, the Contract for Sulby WTW, in the sum of £12.3m was awarded to Earth Tech Engineering Ltd in April 2003, with the proposed Douglas WTW being put on hold pending Planning approval.

Process

The new Sulby WTW can reliably produce between 5 and 21 Ml/d of potable water. The Sulby and Block Eary impounding reservoirs

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Sulby, Isle of Man WTW: Inlet overflow at 35Ml/d *courtesy: Sulby Water Treatment Works Team*

provide raw water via two gravity mains. The first main supplied the old works and the second is a new 400mm NB ductile iron main approximately 3.2km in length, constructed under a separate contract.

Sulby IR is the main source, having moderate levels of colour (average 26.5^0 hazen), low levels of turbidity (average 1.31 NTU), occasional peaks of iron and manganese and low levels of alkalinity (typically <5mg/l as CaCO3).

Sulby WTW has the following main treatment processes:-

* inlet blending of the two source waters and supernatant from the dirty washwater clarifier;
* re-mineralisation, using carbon dioxide and lime slurry;
* coagulation, using ferric sulphate;
* clarification by dissolved air flotation; the sludge float is removed hydraulically;
* Badenoch & Bouchier compliant primary filtration through six rapid gravity filters equipped with plenum floors and dual (sand/anthracite) media beds.
* secondary filtration for manganese removal, after pH adjustment and chlorination, through four rapid gravity filters equipped with plenum floors and sand media beds
* disinfection, using sodium hypochlorite and detention in two parallel chlorine contact tanks.
* plumbsolvency, control using orthophosphate.

A common clean backwash tank is utilised to backwash both primary and secondary filters. Dirty backwash water is blended with sludge thickener supernatant, coagulated, flocculated and passed through a lamella clarifier. Clarified supernatant gravitates to the inlet, clarifier sludge being drawn off and blended with DAF sludge.

Other ancillary processes are:

* thickening of the blended sludges;
* sludge dewatering in a membrane press.

Sodium hypochlorite is produced on site from brine, the salt and other treatment chemicals being procured and delivered to the Island through the Authority's membership of the South Staffordshire Purchasing Consortium.

Sulby WTW has been provided with 'intelligent' MCC's, an innovation promoted by Earth Tech during the tendering process. A diesel generator provides emergency back-up to the site's mains power supply..

Environmental & Planning

The new WTW site at Sulby Glen is one of the most scenic areas of the Island. Coupled with a confined site bounded on one side by the Sulby River, this gave high priority to both environmental and planning considerations.

All chemicals and main processes are contained within an architect designed multi-level building, which was re-designed by Earth Tech whilst maintaining the same architectural appearance. Island legislation required planning re-submission following the re-design, approval being gained in due course.

The building has a structural steel frame, founded on the reinforced concrete tanks and substructures, clad with Manx stone and sawn green oak with tiled roofs.

Construction phase
Earth Tech commenced design on Contract award, but due to the need for the revised planning approval, Civil construction didn't commence until September 2003, with site establishment and clearance before a cofferdam was driven.

Despite some difficulties with driving through boulder clays, the cofferdam and main excavation were complete by the end of November and substructure construction commenced.

Over the next seven months all the main substructures and tanks were completed and tested, positioning of processing equipment commencing in May 2004, as did steelwork erection and Manx stone walling.

Mechanical installation commenced in August, when the main building roofs were weather-tight and electrical installation followed, starting in October.

Commissioning activities commenced in May 2005, the Plant successfully entering into supply in September. After successful testing, a Take-over Certificate was issued to Earth Tech on 14 October.

Two of four scheduled Performance tests have been successfully completed and it is anticipated that all remaining snags and defects will have been resolved by October 2006, so that the Acceptance Certificate can be issued on schedule. ■

Project team
Purchaser: Isle of Man Water Authority; **Design & Construct Contractor:** Earth Tech Engineering Ltd; **Civil Sub-contractor:** Charles Brand (Civil & Structural design; WS Atkins); **Purchaser's Project Manager& Design Consultant:** MWH; **Planning Supervisor:** Holmes Grace Bullen; **Cost Consultant:** E C Harris.

Note: *The Editor & Publishers would like to thank the Sulby WTW project team for the above article.*

Sulby, Isle of Man WTW: Primary Filter gallery and basement