

Carran Hill WTW

new £10m WTW for Crossmaglen & district

by Paul Townson & Bob Rowntree

The new £10m Carran Hill Water Treatment Works, situated on the outskirts of Crossmaglen, County Armagh, Northern Ireland, is due to be fully commissioned in Autumn 2006. When complete, this modern works will produce an output of 6.8 MI/d of potable water, supplying the town of Crossmaglen and surrounding rural areas. The new works is one of a number of water treatment works currently being undertaken by EarthTech Engineering and Farran's (Construction) Ltd., as part of NI Water Service's Water Quality and Treatment Framework.



Carran Hill WTW: New works to be opened in 2006

photo courtesy Water Service, Northern Ireland

Process outline

The new works is designed to produce a maximum output of 6.8MI/d of potable water. Raw water to the works is received via a pumped main from Lough Ross reservoir located 1.8km from the site.

The process adopted is a four-stage process consisting of a front end coagulation stage, using Dissolved Air Flotation (DAF) followed by three stages of rapid gravity filtration.

The treatment process consists of the following stages:

- * raw water intake pumping station;
- * inlet flash mixing where chemical conditioning is provided by dosing Aluminium Sulphate & Sulphuric Acid for the main coagulation process with Lime dosing downstream prior to the primary filters and Manganese Removal filters to optimise the pH;
- * clarification stage comprising three parallel streams of flocculation and Dissolved Air Flotation Cells;
- * four rapid gravity primary filters for removal of residual aluminium, provided with 1000mm depth of dual media comprising 16/30 sand and anthracite, which is suspended on a plenum floor fitted with CADAR filter nozzles;

- * interstage pumping to three No. Granular Activated Carbon (GAC) Contactors for removal of taste and odour. GAC contactors are provided with a 1200mm depth of GAC;
- * three iron and manganese removal filters provided with a single 1000mm layer of 14/25 sand;
- * disinfection of treated water provided by Hypochlorite, dosed prior to the Manganese Removal Filters to oxidise the manganese for removal. A final trim dose of Hypochlorite is provided downstream of the Manganese removal filters prior to water going into supply;
- * existing clear water tanks on site of the existing plant are to be refurbished and additional capacity provided by provision of a new clear water tank - 1.2ML capacity;
- * dewatering of the DAF float and washwater is being achieved by blending in agitated storage tanks with onward thickening via 2 No. lamella thickeners, with the thickened sludge waste tankered off site.

Extensive on-line Water Quality Instrumentation is incorporated into the design to monitor and control the plant at the various process stages, to allow the plant to run in automatic operation with minimum operator intervention. The plant status will be available by PC monitoring terminals located in the plant control room, with group and common alarms available for transfer to a telemetry station giving remote access and control of the plant.



Carran Hill: The old works

photo courtesy Water Service, Northern Ireland

Procurement approach

A joint venture partnership of Earth Tech Engineering Limited and Farrans (Construction) Limited, was awarded the main design and build contract, based on NEC option C (Target Cost Reimbursable) Conditions of Contract, in September 2004.

A partnering and integrated supply chain approach was adopted as a means to achieve the optimum value solution and activities were consolidated to reduce the overall project programme. This was achieved by early involvement of the end user and the fostering and co-operation of selected key suppliers during the initial design development phase and continuing this relationship into the procurement and construction phases.

This collaborative working and knowledge gained throughout the design development phase was continued with the team, to develop detailed designs and support construction in delivering the works into construction i.e the working relationship between Earth Tech and Farrans, Water Service and the contribution of the civil designers and the early contribution of key M & E suppliers ensured that M & E interfaces were incorporated into the design/construction effectively and scope creep kept to a minimum.

Programme

Civil works commenced on site in November 2004, with the main civil works and main mechanical and electrical installation works

completed in May 2006. Commissioning activities followed with operational plant take-over (water into supply) targeted for September 2006 - some two months ahead of programme.

The use of Constraint Management Techniques for programming the works was adopted for this project using a fully integrated programme for design, procurement and construction activities. In general terms, the constraint management techniques removes programme float from individual activities in the baseline programme, leaving an overall float called the 'buffer' at the end of the programme. The percentage of buffer used is compared against the percentage critical path and plotted on a chart which gives a visual indication of progress performance.

To achieve the above, it was necessary to produce a fully integrated programme incorporating the design, procurement and construction phases and fully integrating the civil and M & E elements and key supplier programmes into one programme for monitoring and reporting against,

Using this approach avoided key suppliers needing to produce and maintain separate programmes - this in itself saved time by eliminating duplication of effort.

Joint Planning Workshops were held between Earth Tech/Farrans, civil designers and key M & E suppliers, to establish a base line

construction programme that suited the overall project time objectives. This initiative helped the designers and suppliers to plan their design/fabrication workload to suit their internal resources and capability and at the same time to meet the overall project objectives.

Key performance indicators & respect for people initiatives

Adoption of Respect for People initiatives and benchmarking performance of key suppliers/subcontractors on site with respect to site safety, quality, workforce satisfaction, working environment and team effectiveness, has allowed continuous feedback and improvement measures to be incorporated during delivery of the project.

Summary

The open book partnering approach adopted by the team through the fostering of good relationships with key strategic and local suppliers, is clearly one of the major factors why this project is proving to be a success in delivering the project under budget, on time, and to the right quality.

This form of collaborative working with all parties, instilled from initial design to delivery phase, combined with the innovative use of supply chain initiatives, theory of constraints planning, open book accounting, performance benchmarking and continuous improvement methods, have ensured that the best value solution for the Client (Department for Regional Development Water Service) has been obtained.

At the time of writing the new plant is nearing construction completion, with commissioning works now in progress. The works are due to be put into service in September 2006, some two months ahead of programme. ■

Note: *Paul Townson is Project Manager with Earth Tech Engineering Ltd., Bob Rowntree is Project Manager with Water Service, Northern Ireland.*



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photo courtesy Water Service, Northern Ireland



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