

Fofanny WTW, Co. Down

sympathetic design and construction in sensitive environment

by

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Fofannybane Water Treatment Works constructed in the late 1960s and subsequently extended on several occasions, is located in the lower Mourne area, on the side of Butter Mountain, overlooking the village of Kilcoo in Co. Down, approximately 8km west of Castlewellsan, Northern Ireland. In order to meet EC regulations, the existing works, which is capable of supplying up to 32 MI/d, would have to undergo major refurbishment. It would also have required upsizing to provide water to two other areas - Annalong and Kilkeel. Faced with the difficulties of developing the existing works Northern Ireland Water Services decided to develop a new works to construct a new water treatment works to supply some 52 MI/day of potable water, to the requirements of EC Water Directive 80/778/EEC, to some 100,000 consumers in southern parts of County Down.



Fofanny WTW: Artists impression of works “buried” in the Mountains of Mourne

courtesy Earth Tech Engineering Ltd

Area of outstanding beauty

The Mourne area, classed as an Area of Outstanding Natural Beauty, is part of the Countryside Policy Area and is a candidate for National Park status. The local economy is dependent on tourism, and in particular scenic and activity-based tourism. It was, therefore, very important that the design of the new works had the minimum possible impact on the environment.

In siting the new works, Water Service, in association with expert architectural and environmental engineering consultants, considered various locations for building the new works, taking into account environmental, engineering and economic criteria. Assessment of the criteria showed that the site most suitable for the new works was on previously disturbed land – which was used for tree cultivation – just north of the man made Fofanny Dam. Records indicated that

this area showed no evidence of archaeological features and environmental studies suggested that the flora and fauna of the area demanded no special treatment.

Further consideration of environmental aspects led to a decision to merge the building into the landscape, making it invisible from as many viewpoints as possible.

In April 2003, Earth Tech Farrans were appointed as the preferred bidder for the project. The tender proposal was based on an **earth sheltered design for the new water treatment works.**

Caring for the environment

The site chosen for the new works is a highly environmentally sensitive site lying adjacent to the Shimna River. Throughout the course of construction and thereafter measures were taken to protect local water courses and the finished works will be landscaped using indigenous vegetation.

The detailed Environmental Statement addressed many issues such as air quality, noise, flora and fauna, archaeology, visual impact and emissions from the new works. Environmental specialists were retained throughout the life of the project to provide expert advice and the contractor worked to a specified Environmental Management Plan as agreed with the Environment and Heritage Service.

Nature of contract

Following the appointment of Earth Tech Farrans, the tender design went through a detailed design and development stage. This involved all parties and stakeholders working together under a partnering team ethos for a period of five months.

At the same time, the Fofanny project management team embarked on a two-phase consultation period to inform local councillors, statutory bodies, local interest groups and the general public about plans for construction of the new works well in advance of submitting a planning application.

During this consultation phase the design was optimised and developed to take into account, safety, buildability, whole-life costing and operational requirements. This team approach, enabled all parties to be involved in the initial development period and to 'buy in' to the final solution. This resulted in a more efficient detailed design and procurement phase for the project. The development process was based upon methodology developed on earlier Aquarius 3 (Mourne WTW) and Loughmacrory projects.

Following receipt of Planning Permission for the scheme in November 2003, *Earth Tech Farrans* was awarded the main contract for design and construction of the plant. The contract is NEC Option C (reimbursable) with a tendered Target cost.

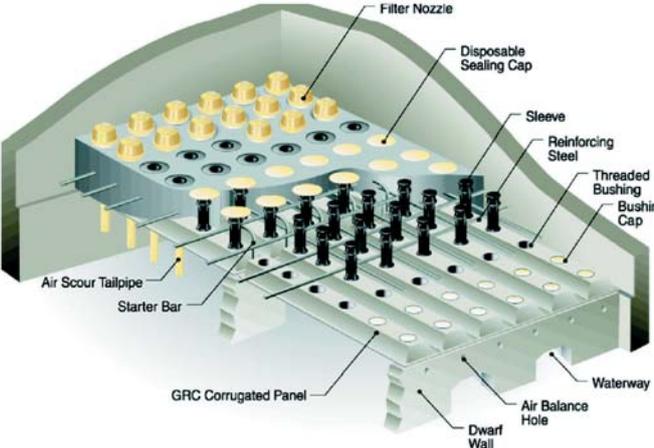
Babtie Group successfully project managed the project during the early phase of the contract before Water Service procurement took over the role. Key personnel involved on the Aquarius 3 (Mourne WTW) project both on the client procurement team and contractor sides transferred to the Fofanny WTW scheme.

New works

The new works is designed to produce between 18 and 52 Ml/day of potable water. Raw water will be supplied from three sources, Spelga Dam, Fofanny Dam and Lough Island Reavy Reservoir.



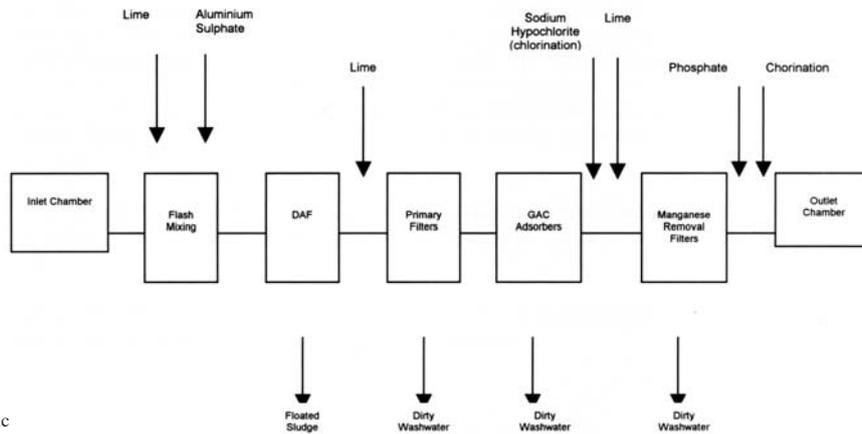
Monolithic Filter Floor



- Becomes a permanent part of the civil structure with little or no long term maintenance
- Totally flexible to accommodate variable nozzle densities and nozzle types
- No seals to fail or degrade
- Designed to optimise specific flow rates
- Suitable for separate or combined air/water wash regimes (collapse pulse)
- Stronger than other filter floor systems, allowing high rate pressure testing
- Flexible plenum height dimension from 250mm-1250mm
- Compatible with any filter dimensions and adjustable on site
- Pier or Dwarf Wall design
- Low cost, simple installation
- Long term savings on maintenance costs and media loss prevention
- Ideal for new or retrofit
- Proven worldwide

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Main Process Flow Schematic

The Spelga source is a soft moorland water with high colours, particularly in the winter, and moderate turbidity. Levels of iron and aluminium are above the regulatory levels. Manganese levels are variable with increasing incidence of high spikes. Fofanny water is similar in nature but the colours are lower. Lough Island Reavy is much lower in colour but is subject to algal blooms. *Cryptosporidium* has also been identified as a risk.

The process adopted is a four stage operation, consisting of DAF, rapid gravity filtration, GAC adsorbers and manganese filtration (see process flow schematic). The location and nature of the design solution will make additions to the process very difficult. Consequently, the process design parameters were agreed to provide a robust solution.

New works process details are:-

- * inlet flash mixing and chemical conditioning by dosing with aluminium sulphate and lime;
- * clarification stage comprising five parallel streams of flocculation and dissolved air flotation;
- * correction of pH with lime followed by six rapid gravity primary filters for removal of residuary aluminium. The filters contain dual media comprising sand and anthracite suspended on a plenum floor fitted with CADAR filter nozzles;
- * four granular activated carbon (GAC) adsorbers for removal of taste and odour and reduction in THM precursor;
- * pH adjustment with lime and addition of sodium hypochlorite to oxidise soluble manganese prior to removal by four fast rate sand filters;
- * disinfection of treated water is provided from bulk sodium hypochlorite. A final trim dose is provided downstream of the manganese removal filters prior to water going into supply. Orthophosphoric acid is also dosed before water leaves for plumbo solvency control;
- * final water leaving the works flows by gravity to the existing clear water tank at Fofannybane. A variable speed pumping station also to be constructed at the works to deliver up to 8 ML/d to Crocknafeola service reservoir which will supply the area of Annalong and Kilkee;
- * clarification of the process sludges removed by the DAF and Filter washings is achieved by lamella separation technology. The sludge produced is then pumped to a membrane filter press. Pressed sludge is removed from site for disposal at a licensed landfill site. The supernatant from the separators is treated to meet a stringent solids specification before returning to the head of the works.

Intelligent MCC

The works adopts state of the art Intelligent Motor Control Centres incorporating the use of intelligent starters where the status of plant drives and instruments throughout the plant are transmitted to the PLC

control system via a duplex ‘Profibus’ DP communications network. Plant status and indications are to be made available via Human Machine Interface Devices (HMIs) fitted on the ICA section of the MCCs.

The majority of level, flow pressure and water quality instrumentation selected are ‘Profibus’ compatible and connected to the network.

Extensive on-line water quality instrumentation is incorporated into the design to monitor and control the plant at various process stages to allow it to run in automatic operation with minimum operator intervention. Plant status will be available on SCADA systems via two PC hardware terminals located in the plant control room and on the HMI devices at the MCCs. Group and common alarms will be made available for transfer to a telemetry station giving remote action and control of the plant.

Project Programme

A site start was made in November 2003. Main civil construction activities were well advanced with washwater and manganese filters substantially complete by March 2004.

One of the unique aspects of this project is that the concept of ‘Critical Chain Project Management’ is being used to programme the work. This is a management tool used to assist completion of the project by Contract Completion Date. It is based around a revised way of thinking with regard to estimating task durations and allocating the appropriate risk associated with the task/project. Time allowance included in an activity to cover task risk is removed and put into a ‘project buffer’. The programme is then updated weekly, the project buffer monitored and appropriate action taken to ensure a suitable level of buffer is maintained to the end of the project.

Current target completion date for the WTW using this concept is September 2005, which is three months ahead of the original contract completion date.

Once the new Fofanny WTW is successfully up and running, the old works at Fofannybane will be decommissioned..

For the people of South Down and particularly those who live in the locality, the new Fofanny WTW will offer many benefits. Not only will it provide a safe and reliable drinking water resource for future generations but it will also put an end to the visually unacceptable practice of dumping sludge on the catchment of Spelga Reservoir. In addition, it will allow Water Service to remove the existing Fofannybane works which is viewed by many as a blot on the local landscape and make this area of the Mourmes more attractive.

Note: The author, Norman Johnson is with Earth Tech Engineering Ltd.