

## Refurbishment of three United Utilities WwTWs Joint Venture delivers £6m contracts against the clock

**M**arch 2003 marked the completion of year 3 of United Utilities' AMP3 and with it the completion of the refurbishment of three wastewater treatment works in the north west of England. In this article we describe in some detail the successful delivery of these three schemes by a joint venture partnership working under a Framework Agreement Contract, with individual works contracts being awarded using the Engineering Construction Contract (ECC) Option C.



Ingleton WwTW (courtesy KMI Water & United Utilities).

KMI Water, a joint venture formed by three of the UK's largest construction companies Kier Construction Ltd, J. Murphy Ltd and Interserve Project Services Ltd, was awarded a contract to provide United Utilities (UU) with a totally integrated organisation to deliver part of its 3rd Water and Waste Water Asset Management

Programme (AMP3) between 2002 and 2005. The Framework Contract was awarded in early 2002 with an indicative value of approximately £250m. The following three projects fulfilled just part of KMI Water's overall AMP3 commitment amounting to £6 million of the envisaged contract value.

**Barton Wastewater Treatment Works**

Barton WwTW serves the villages of Barton, Broughton and Bilsborrow, lying six miles north of Preston with a population of 5479. The existing treatment consisted of screening, grit removal, primary treatment, biological filtering and final settlement. Storm tanks and sludge storage also featured on site with effluent discharging to Barton Brook, a tributary of the River Wyre.

The 72 week contract to modify the existing facility was required by the Environment Agency (EA) to achieve an improved effluent standard under the Freshwater Fish Directive. The project was awarded on 28th February 2002 with an original completion date of 15 July 2003 and a value of £1.2 million.

**The contract comprised the following new workworks:**

- \* two hopper bottomed primary tanks with half rotating scraper bridge and scum removal equipment;
- \* one hopper bottomed, humus tank with half rotating scraper bridge and new flow distribution chamber;
- \* primary tank pumped auto desludging;
- \* plastic media, nitrifying tower filter including submersible feed pumping station and process pipework;
- \* interconnecting process pipework and rising mains;
- \* refurbishment of percolating filters to include structural repairs to filter walls, replacement of rotating distributors and dosing syphons and the part replacement of stone filter media;
- \* general maintenance items included demolition of redundant process equipment and replacement of minor mechanical and electrical items;
- \* provision of new internal areas of site access roads;
- \* accumulator washwater system;
- \* modifications to instrumentation & control;
- \* land drainage pipework and outfall.

**Constraints**

From the outset there were constraints within the programme that meant the time left to complete the project was extremely tight. However, the close collaboration between United Utilities (UU) operations, the Montgomery Watson Harza (MWH) design construction team and the KMI Water site team meant that a compromise was reached to relax certain constraints and not only meet but beat the deadline. The aggressive programme required sectional completion by 12 December 2002 to deliver the projects output. The team working approach meant this very tight deadline was met right on time.

**Challenged**

In yet a further demonstration of a joined up approach, when it came to refurbishing the percolating filters, the team challenged the need to isolate each of the four filters, taking every one out of process for a four week period leading to a complete loss of media and subsequent eight weeks to reseed. It was decided not to work on each filter in rotation but to replace the top 500mm of old stone filter media throughout the day then reintroduce the effluent via the distributor arms at night. This meant that the new media was wetted almost immediately, leading to a significantly reduced reseed period of just one - two weeks. It was also agreed to undertake refurbishment of these percolating filters concurrently with the humus tank construction – another time saving exercise.

**A true demonstration of a project team delivering a successful solution using good practice and collaboration.**

**Effluent quality**

Original final effluent parameters 95%ile spot basis

BOD <sub>5</sub> (mg/l)	Suspended solids (mg/l)	Ammoniacal nitrogen (expressed as N) (mg/l)
30	45	10



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*Barton NTF*



*Something a little larger*



*Part of the new internal structure*

**Required final effluent parameters, 95%ile spot basis**

BOD <sub>5</sub> (mg/l)	Suspended solids (mg/l)	Ammoniacal nitrogen (expressed as N) (mg/l)
20	30	3

**Sectional deadlines**

Section	Content	Completion required by End of week number
A	Washwater pumping station .. .. . installed & commissioned	<b>Week 16</b>
B	Humus tank commissioned & fully operational.  Nitrifying filter, alkalinity dosing & filter feed/recirculation pump station shall be commissioned, fully operational & achieving AMP3 consent.	<b>Week 40</b>
C	Remainder of the works	<b>Week 72</b>

**Pilling Wastewater Treatment Works**

Pilling WwTW, situated in the north of the Fylde some 5 miles east of Fleetwood, was required by the EA to achieve an improved effluent standard under the UWWTD and Bathing Waters Directive (BW)

The project was awarded on 28 February 2002 with a value of £1.2m and comprised the design, construction and commissioning of a new WwTW to be built as an extension to the existing WwTW, close to the village of Pilling. The new wastewater treatment works has to achieve 95%ile standard of 40mg/l BOD and 60mg/l SS, with UV disinfection. The works is designed to serve a domestic population of around 1019 Pe. This figure does not include for two large caravan sites, which increase the seasonal population by some 345.

Pilling WwTW receives raw sewage from the Pilling Catchment via two terminal pumping stations. Existing treatment consisted of coarse primary treatment followed by a tidal discharge tank. Effluent discharges into Broad Fleet through a tide locked sluice, flows then enter Morecambe Bay. The works currently receives up to 3.97Ml/d directly from two network pumping stations and treats up to 1.6Ml/d with discharges limited to three hours at high tide and complies with its current consent of 150mg/l SS.

During the optioneering phase, it was determined that there would be no storm discharges from the new wastewater treatment works. Storm flows would be contained in a blind storm tank and the existing storm overflow discharging into Broad Fleet was to be abandoned. During pre-construction activity it became apparent that ground conditions were extreme. Most of the major structures were founded on pre-cast concrete piles driven 23 metres into stiff clay. A 32m x 18m cofferdam was installed to allow construction of two Humus tanks. Topsoil from the site was stockpiled locally on a site owned by the EA, saving costs and time and ultimately 550 cubic metres of surplus material was donated to EA for maintaining and repairing the local flood bund.

**Ingleton WwTW** serves a population of 1718 in North Yorkshire, approximately 15 miles to the north east of Lancaster. The population is significantly increased by a large number of day visitors during holiday periods and weekends.

KMI Water's 48 week contract comprised the building of an entirely new WwTW adjacent to the site of the existing WwTW, together with the abandonment or demolition of the existing treatment units.

The existing plant consisted of a small inlet works, a single primary tank, single trickling filter and single humus tank. A lagoon system treated both the humus tank effluent and storm flows prior to discharge to the River Greta which runs adjacent to the site.

**The project generally comprised:**

- \* replacement of pumping station to take flows from Clarrick Terrace and site foul drainage;
- \* inlet works incorporating 6mm screens, side weir overflow to storm tank, measurement of flow to full treatment and grit removal;
- \* two 7m internal dia.circular primary settlement tanks with auto-desludging;
- \* interstage and recirculation pumping station;
- \* two 26m internal diameter rock media trickling filters;
- \* two 7m internal diameter circular humus settlement tanks with auto-desludging;
- \* one storm tank split into blind and through flow sections;
- \* two sludge holding tanks;
- \* site pipework and chambers;
- \* control/administration building;
- \* MCC kiosk;
- \* odour control plant;'
- \* extension to existing outfall;
- \* improved existing site entrance and access road.
- \* MCCs, PLCs, instrumentation control and automation hardware and software, housed in control/administration building or MCC kiosk;
- \* power & control cabling;
- \* telemetry & fully automated control facilities housed in control/administration building.

**Lack of time**

Once again, the ongoing construction constraint was lack of time. The £3m project was awarded on 17 May 2002 which meant that the mainstay of civils construction would take place during winter months when the water table would be at its highest. Site water run off was thus a particular problem with only one pump and hose to maintain the water table to a practical level and a need to dispose of excess water in line with EA guidelines. The site team collaborated to successfully come up with a solution to dispose of the excess water by adopting the existing filter beds.

The new works were to be partly located on land occupied by the existing final settlement lagoons. The construction programme had to both encompass maintaining existing flow while achieving new build aspects. Programme specified sectional completion with both works running in parallel until UU process operations were satisfied with the flows. Finally, the decommissioned lagoons were required to be emptied and any contaminated material removed from site so that the foundations for new units could be formed.

Since the works is located within 125m of existing residential property all construction activity had to be achieved in consideration of the local surroundings. This was reflected in the planning application where new buildings were designed in sympathy with local surroundings. Due care was also vital to minimise noise and odour during the construction period. The project delivered its Regulated Output on time in March 2003. ■

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Ingleton WwTW (courtesy KMI Water & United Utilities).



Pilling WwTW (courtesy KMI Water & United Utilities).