

Stockport WwTW

early start project for UU's Southern Area integrated alliance

by
Andrew Kennedy

Stockport WwTW is included in the WwTW Quality Programme, for process enhancements to improve performance in relation to BOD, suspended solids and ammonia in line with the River Quality Directive. The future consent standard to be applied is 20mg/l BOD; 30mg/l SS and 10mg/l ammonia, and the Regulatory Compliance date is 30th September 2007. The existing process serves a population of 160,00 and utilises an activated sludge process to treat an FTFT of 160MI/d. The original ASP stream, or Haworth Plant, was constructed in the 1920s and extended in the 1970s by the introduction of a further ASP stream known as the Simplex Plant.



Stockport WwTW: Overview of works

photo courtesy MWH

In April 2004, Montgomery Watson Harza (working under amended AMP3 contract conditions) and supported by United Utilities Process Engineers and Operations Representative commenced Solution Identification work.

The challenge

Integrating a new solution into a restricted site, bounded by the M60 motorway, a railway and the River Mersey, proved to be the main challenge. With little opportunity to expand the works boundary, significant layout development and construction planning work was undertaken. At an early stage the project team recognised that significant detail was needed to ensure the new works could be incorporated on the site and was compatible with the existing assets being retained.

Extensive process and hydraulic design time was spent early on in the project to firm up the fundamental requirements and establish the first stage design "freeze". It is testament to the early development work that no significant layout changes have subsequently been made.

Option for approval

After a nine months Solution Identification phase, that included a period of re-work resulting from a regulatory change, work culminated with the Preferred Option being presented for United Utilities approval in December 2004.

In summary the approved scope comprised:

- * new 25,000m³ Nitrifying Activated Sludge plant (Aeration basin);
- * four No. 41m diameter final settlement tanks to augment existing being retained;
- * interstage pumping station;
- * replacement sludge storage and treatment;
- * removal of primary tank co-settlement;
- * abandonment of redundant assets;
- * ancillary site works, roads, washwater system etc.

High Level Statistics include:

- * 23,000m³ of concrete;
- * 1,800 tonnes of reinforcement;

- * 15km of cabling
- * 7km of process pipework
- * 750.000 man hours to be worked with 170 operatives working on site.

Solution scope book

Drafting of the Solution Scope Book commenced in January 2005 and, following extensive technical reviews to ensure compliance with the latest UU Design Standards, was issued for solutions pricing in August,

At the same time, the first of several advance implementation funding requests was approved, which allowed the first stage of site preparation work to progress. This required disposal of a redundant sludge lagoon. This work was managed directly by UU.

The early construction planning proved invaluable and GCA-JV was established on site in June 2005 to commence site preparation and service diversion works. At the same time that Solution pricing commenced, detailed design work progressed on critical path activities with selected packages being released for implementation.

The practice of releasing selected packages formed a key element of the delivery strategy and continued over several months until the £36m project obtained full Project Approval in December 2005. Once all project approvals and orders were in place full construction work progressed with several large sub-contracts awarded for piling, reinforced concrete work and pipework.

Main scheme element

Main element of the scheme involved the construction of a Fine Bubble Diffused Air (FBDA) Aeration Basin, approximately 75m x 70m x 6m deep, founded on 825 No.750 kN piles. Aeration blowers and associated control equipment being housed in a separate building. The 41m diameter x 6m deep flat bottomed final tanks are also founded on piles and are currently the largest to be constructed within UU.

The piling sub-contract was awarded to *Cementation* in January '06 and the installation of 1800+ piles was completed to programme. The piles were installed and tested in stages, releasing areas for construction to progress, thereby helping to optimise the programme.

To enable early release of the main Aeration Basin construction area, existing operational sludge consolidation tanks had to be demolished. To compensate for the loss of operational facilities, UU operations have utilised two mobile gravity belt thickeners (GBTs) to thicken sludges to approximately 6%DS before being tankered off site. The net result is a cost neutral impact to the works operational budget as well as a project cost saving. The temporary thickening is intended to operate until the new sludge consolidation tanks are fully commissioned and handed over to UU Operations.

Early involvement with concrete sub-contractors has also proved invaluable as the detail design team were able to agree movement joint locations, precasting options together with construction and pour sequences in advance of detailed design.

Final tanks

The construction of the 41m diameter final tanks was sub-contracted to *Galglass*. The size of the final tanks required tanks to be constructed in three two metre lifts using a continuous thin wall

construction technique. On completion of the outer walls, soffit shuttering was installed internally to form the complex internal launder arrangement, and special wall formwork was manufactured to maximise construction efficiencies. Circularity of the tank was critical, as the design incorporated rotating half bridge scrapers, provided by *Varis Engineering*. The site team rigorously monitored construction quality and tolerances to minimise civil mechanical interface issues, and all four scraper bridges have been successfully installed ahead of schedule.

Pumping station

The interstage pumping station that feeds the Aeration Basin incorporates pumps which lift flows into an elevated discharge chamber. The chamber not only provides sufficient hydraulic head to feed the downstream distribution chambers, but also eliminates the need for an extensive valve chamber. The position of the pumping station was selected to minimise excavation and temporary works requirements. Its proximity to the existing aeration basins will benefit flow diversions when the basins are de-commissioned.

The detail design team developed 3D images to aid constructability and resolve clash detection issues. 3D imagery has also proved invaluable in providing UU operations with a detailed appreciation of the work and has been used to steer the project swiftly through both Hazard and Operability (HAZOPS) and Access Lifting & Maintenance (ALM) reviews.

United Utilities (UU), Montgomery Watson Harza (MWH), and GallifordTry Costain Atkins JV (GCA-JV) are the three partners in UU's Southern Area Integrated Alliance, set up to deliver United Utilities AMP4 Capital Investment Programme. MWH as Solution Services Provider (SSP), in association with UU form Solutions and Engineering to take projects through the Solution Identification and Development Phases (SID), culminating in a project Solution Scope Book. GCA-JV as Process Partner undertake detailed design, construction and commissioning. UU input is provided throughout the Project lifecycle to ensure a fully integrated team approach.

Early M & E input

Early M & E input has been vital to ensure the smooth delivery of this Project, which has required the timely procurement of the specified equipment and materials, much of which has been on very long lead in time periods.

Construction work has benefited from the daily input of UU operations. This has included the location and determination of existing services, access and egress issues, flow diversions, flow control, maintenance issues, interfaces and commissioning planning.

At the time of writing (April), construction is over 90% complete with only the main distribution chambers outstanding. Mechanical & electrical installation is ongoing and on target to be completed in time for turn of flows.

Overall the project is on programme to beat the Regulatory Compliance Date of 31st September 2007. ■

Note: *The Editor & Publishers wish to thank Andrew Kennedy, Senior Project Manager, Integrated Alliance South for providing the above article for publication.*



Stockport WwTW: Consolodation tanks at sludge area

photo courtesy MWH

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Varis Engineering Ltd was pleased to design, fabricate and install four Final Tank Scrapers for Stockport WwTW.