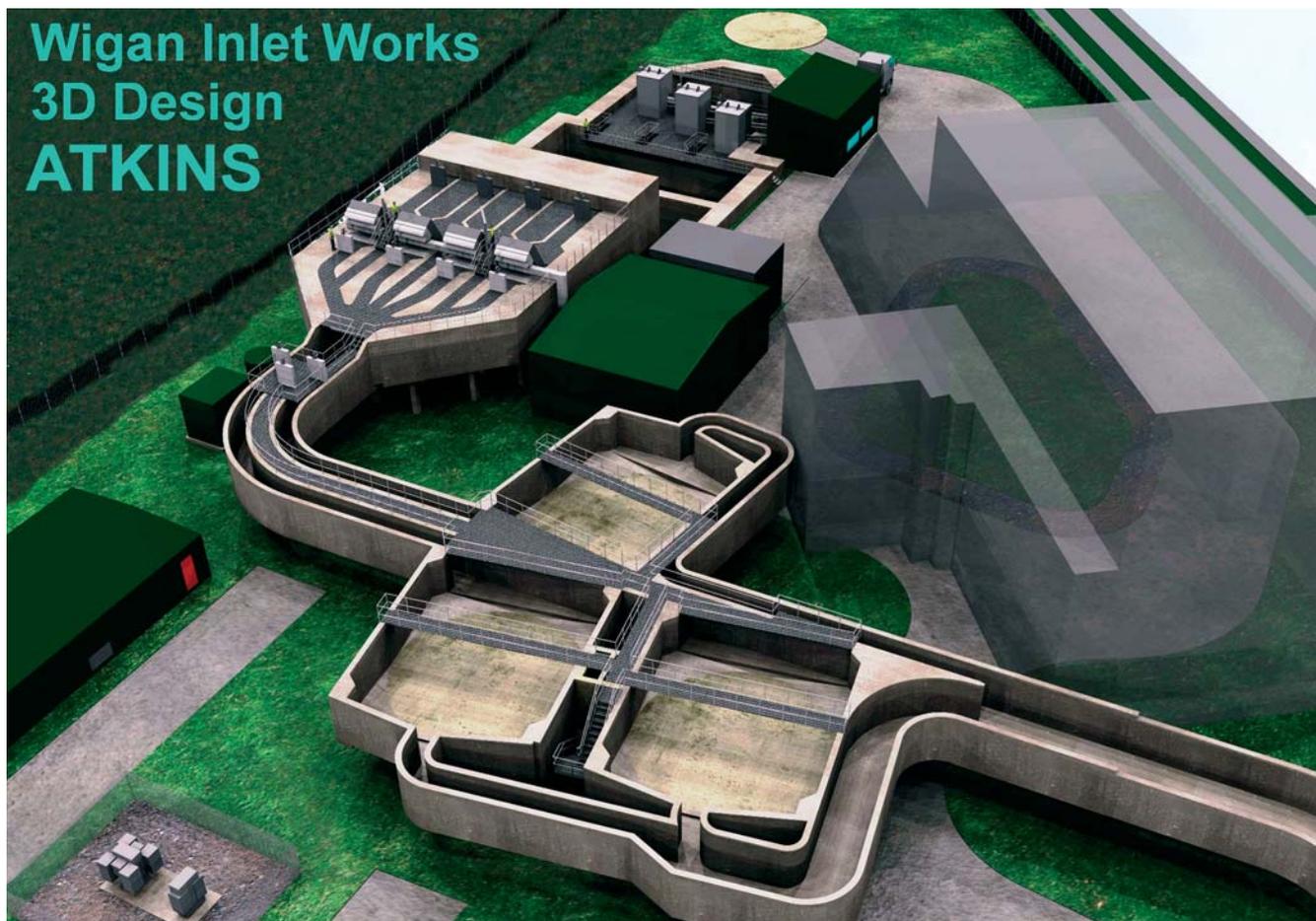


Wigan Inlet Works

innovative design solution for United Utilities

At the commencement of the AMP4 programme, United Utilities vision was clear - for all parties to collaborate and act as one, in partnership, to deliver the capital investment programme at minimum whole life cost, at acceptable risk to the UU business. *United Utilities, Montgomery Watson Harza (MWH) and Galliford Costain Atkins (GCA JV)* formed the Southern Area Integrated Alliance to ensure timely delivery of United Utilities framework programme. *Montgomery Watson Harza*, as Solution Services Provider (SSP) were to take projects through the Solutions Identification and Development phases (SID), culminating in project solutions and scope book - pricing, detailed design and construction is being carried out by the process partner - *Galliford Costain Atkins (GCA)*.



Wigan WwTW: Model of Inlet Works Scheme

courtesy Atkins

Wigan Inlet works scheme

This scheme, one of the Southern Area Framework, early start schemes, is a maintenance project, replacing existing failing assets which, in turn, safeguards operational plant performance to ensure discharge consents are maintained in line with current Environmental Agency standards.

Project background

The Wigan inlet screens project solution was initially prepared by MWH and tendered by Kier Murphy Interserve (KMI) as part of an AMP3 framework contract in 2003. However, the project was deferred into AMP4, following a spending review by United Utilities. In April 2005, and the commencement of AMP4, the Wigan Inlet works scheme fell within the IAS boundary for GCA. United Utilities awarded Solutions Identification and Development phase design (SID) for the Wigan inlet works scheme to GCA in September '05.

Very tight deadlines were set by United Utilities to ensure construction spend before the end of the financial year. GCA's target

was to review the initial project solution, develop and agree alternatives, produce scope book documentation and drawings to the new UU SO9 standard and, compile and agree a solutions price - all by the end of December '05. To achieve construction spend by the end of the financial year, detail design commenced in parallel with scope book production and solutions pricing, ensuring a fully integrated, teamwork approach to the delivery of this challenging project.

GCA set to work in earnest and brainstormed the original inlet works solution, which was to be constructed on a brownfield site within the centre of the existing WwTW. The initial inlet works solution comprised a new section of 2.1m diameter transfer sewer; 500m long x 6m deep and sections of elevated outlet channels, which ran parallel to a main railway embankment. These elements of the project solution posed major construction risk to GCA and alternative solutions were actively considered to make capital savings and to minimise construction risk. Meanwhile, UU business drivers for the Wigan wastewater treatment works site were changing and the

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brownfield site allocated for construction of the new inlet works was no longer available. **This left GCA with a major challenge, as their only available land was a small triangular plot adjacent to the existing inlet works**

Inlet works solution

Numerous options were considered, but after much deliberation, head scratching, option layouts and consultations with United Utilities Process Design Group (PDG) and Operations, the GCA team finally developed an asset standard inlet works option that worked and fitted within the tight constraints of the site. GCA JV's innovative solution was to move away from the traditional 'in series' detritor layout and incorporate an unconventional clustered grit detritor arrangement. Although the existing inlet works was to remain fully operational throughout the construction, its demolition was required upon completion, to achieve the required operational access.

Main scope elements of the new inlet works solution comprise:-

- * main sewer intercept chamber and connecting 2.4m dia sewer;
- * 3 No. 2.0m wide x 50mm gap, coarse bar screens, each rated at 2360 l/s;
- * wet well/Dry well pumping station incorporating 5No Hydrostal variable speed pumps, each rated at 1200 l/sat 12.0m head - 1000RPM max;
- * elevated, screens structure incorporating flow stilling chamber, 5 No 6mm Longwood type escalator screens x 2.0m wide - each rated at 1575 l/s - screens channels incorporating passive emergency by-pass weirs;
- * 3 No 2.0m wide x 4m deep Elevated outlet channels connecting the screens arrangement to 3 No 10.0m diameter clustered grit detritors;
- * 18m x 5m MCC control building together with coarse screens and washpactor process buildings;
- * odour control facility;

- * transformer compound;
- * generator & fuel store;
- * demolition of existing inlet works.

Design Innovation

Once the clustered inlet works solution was agreed, GCA's main task was to turn the concept into reality in a very short space of time. The first step was to prepare and submit a new planning application, which was substantially supported with the aid of 3D images, prepared by Atkins 3D model specialists, which were cut from a 3D visualisation model being prepared for the scheme. The 3D fly through model also proved invaluable with United Utilities operators and the Contractor, as it was used to gain a full appreciation of the project solution and its complexities from a construction and health and safety point of view. It increased operator confidence in the project solution by demonstrating access and operability issues and was used to steer the project swiftly through both Hazard and Operability (HAZOPS) and Access lifting and maintenance (ALM) reviews (see fig 1& 2). The model was also linked to GCA's construction programme, demonstrating to the client that the works could be constructed safely, within the tight confines of the site and to United Utilities Programme dates.

Hydraulic design was also key to the successful delivery of this project. *Atkins* hydraulic specialists developed a range of hydraulic profiles for various flow scenarios and operational maintenance conditions. The flow split to the clustered detritor arrangement proved very challenging, as an equal flow split between detritor inlets and outlets was required to ensure the plant operated to its optimum. The compact footprint of the inlet screens arrangement also meant the passive emergency by-pass weirs were to be incorporated between the dividing walls of the screens channels; this resulted in complex drowned weir arrangements to ensure max flow could be accommodated without flooding.



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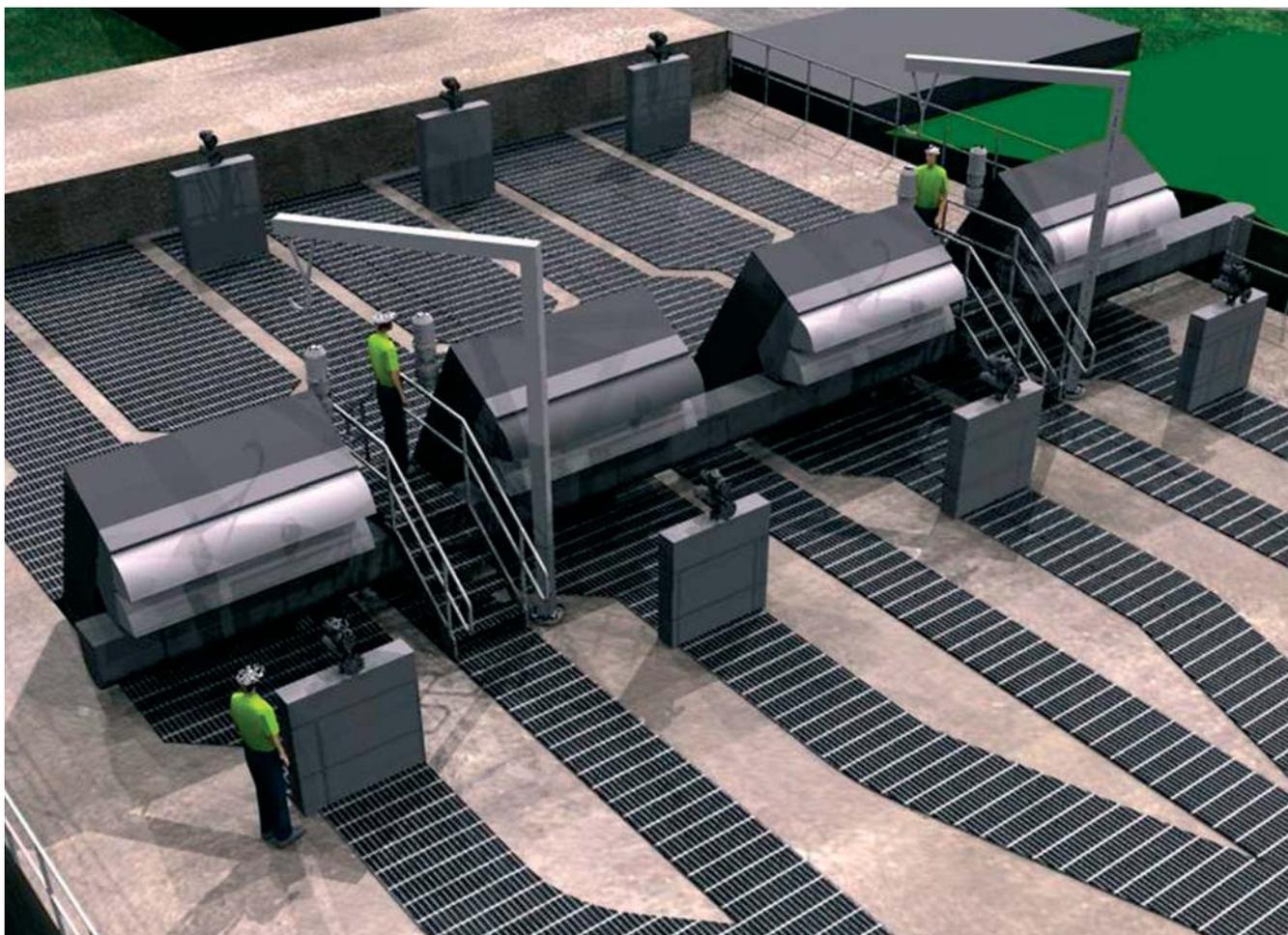









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Wigan WwTW: 3D screens area

courtesy Atkins

In parallel with the hydraulic design, civil and mechanical general arrangements were being prepared and GCA decided, due to significant impact on design, to have a scaled hydraulic model prepared for the full inlet works from interceptor chamber via wet well to fine screens channels, through the clustered detritor arrangement. GCA commissioned BHR group Cranfield (BHR) to prepare the scaled models; (fig3), various flow scenarios and operational maintenance conditions were simulated together with the complex flow split arrangement to the detritors. The results of the model test demonstrated to GCA that the hydraulic design for the plant was correct; it verified the design flow split to the detritors was within 5% of the calculated values and that the inlet pump sump arrangement was satisfactory. Only minor alterations to benching were required - a tremendous effort by the hydraulics team - detail Civil and Mechanical design could now continue without risk.

Construction of the deep inlet pumping station in the tight confines of the site posed another risk to the design and construction team. There was very limited space to install a traditional cofferdam arrangement between the tree line and the operational inlet works. This was recognised very early in the design process and piling sub contractors were brought on board early to discuss the use of secant bored pile walling as both temporary and permanent works. Early design award to piling sub-contractor Bachy, enabled the design of the pumping station to progress at speed - the 33m long x 20m wide, split level inlet arrangement (9m and 4m deep respectively) required the installation of 110No 900mm diameter piles and 95No, 600mm diameter piles. **Once installed the internal face of the secant bored pile wall is lined to form the permanent works.** GCA design team worked closely with the piling sub-contractor and site construction team to optimise the pumping station layout, which in turn maximised construction savings. Structural design of the pumping

station took into account the preferred method of construction with respect to installation of capping beam, temporary propping and excavation maximising work areas. The civil's design of the high level inlet screens/detritor structure was simplified to aid construction, flat soffits were adopted throughout which aided detailing and fixing of reinforcement whilst various changes in level were formed internally with benching. Large volumes of concrete were reduced by using Polystyrene void formers whilst implementation of full height formwork was maximised by the use of pull bars and wall couplings where applicable.

Conclusion

Atkins multi disciplinary design teams are co-located with JV partners Galliford Costain within the Integrated Alliance South offices in Warrington, Cheshire. The close proximity and good working relationships of the various parties within the Alliance has allowed the project to be swiftly re-optioneered with technical and operational issues resolved swiftly. In addition, the GCA team produced technical drawings, specifications, obtained prices and agreed a solution price all within a six month period. Innovation in design was actively encouraged, as demonstrated by the clustered detritor arrangement which was one of the main governing factors that has enabled the new inlet works project to go forward, whilst realising capital savings for United Utilities in excess of £10.0M on the original AMP3 solution. **This was true partnering in operation. Construction is currently 4-5 weeks ahead of programme next critical phase is to ensure procurement and installation of mechanical and electrical equipment goes to programme, to ensure Project in Use Date of February '08 is achieved.**

Note: The Editor & Publishers wish to thank Martin Meadows, Senior Project Team Leader, Atkins (GCA JV) for producing the above article for publication.