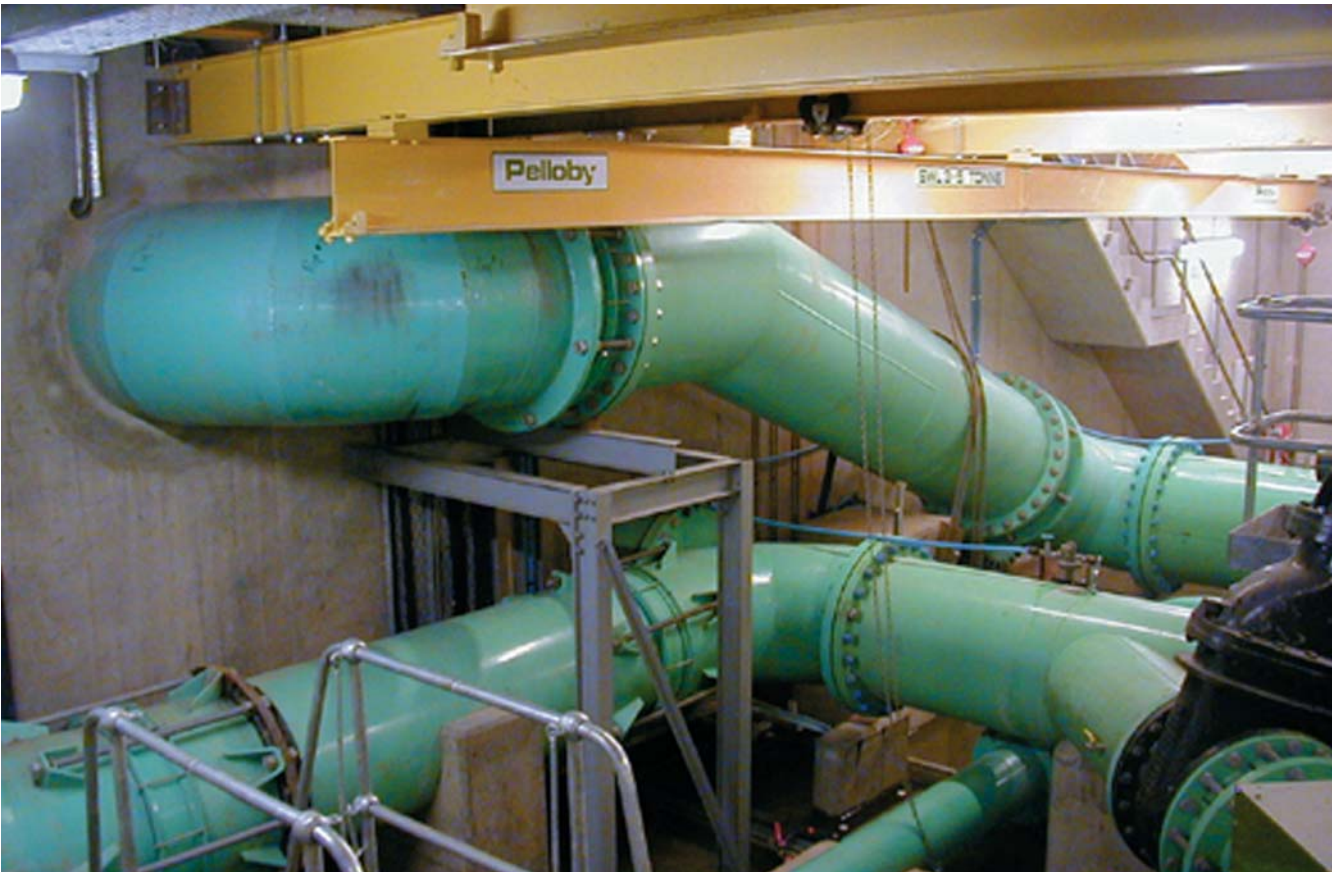


Melbourne WTW – Securing Supply rising mains renewal after several bursts

by
James Dawes BEng, (Hons), MICE, MICIWM

Melbourne Water Treatment Works (WTW) is situated within the Severn Trent Water region area around Ashby de la Zouch, Leicestershire. The WTW (OSGrid Reference: 5745; 2+) is 1 km south of the village of Melbourne, near Derby. As a result of failures of GRP rising mains laid within the confines of the treatment works this scheme mains connected to cast iron and pre-stressed concrete mains at the



Melbourne Mains: Connection of new mains inside HLPS

courtesy Severn Trent Water

The treatment works is capable of supplying up to a maximum of 240MI/d to three service reservoirs. The High Lift Pumping Station delivers 130MI/d through the 1100mm main to Ragdale reservoir, 90MI/d through the 900mm main to Hallgates reservoir and 14MI/d through the 450mm main to Smisby reservoir.

The 450mm GRP main experienced the highest frequency of failures, five in total over three years, disrupting both works output and operation of the distribution system. Fortunately, this did not result in any interruption of supply to the 40,000 population served.

The 1100mm GRP main failed twice, in 1995 and 2001, again with no loss of supply to customers due to the availability of alternative sources. The 900mm main failed for the first time at the end of April 2004. Fortunately the new steel main had passed its pressure test a few days before and was able to be connected and commissioned ahead of programme.

The strategic nature of the mains, combined with their large size and difficult access at the locations where connections to the existing

mains were required made for a complex and challenging project. In order to maintain supplies to customers, shutdowns of the pumping systems had to be carefully planned and co-ordinated to ensure that the reservoirs would not empty.

The route selected ran within the existing site and through adjacent private land, including crossings of a busy main road. *Haswell Consulting Engineers* liaised extensively with landowners, operational staff and the various statutory bodies. They followed ISO 14001 Environmental Management Procedures to ensure the project was designed to minimise the effect of construction on the environment.

Solution & execution of the project

It was decided to deliver the project in two phases, tackling the more vulnerable 450mm rising main first:

- * Phase 1 - replacement of approximately 500m of 450 mm diameter GRP rising main with ductile iron. This was awarded to *North Midland Construction Plc*.
- * Phase 2 - replacement of approximately 500m of

both 900mm and 1100mm diameter GRP rising mains with steel. This contract was awarded as a joint venture to *North Midland Construction Plc* and *Barhale Construction PLC*.

Phase 1 construction started on the 450mm main on the 2nd June 2003 and was operational on the 5th September 2003. In addition an emergency pumping station was installed to boost water from one of the larger mains into the Smisby system.

The three original GRP mains had been laid in a common trench with only one metre spacing between the pipe walls. The proximity, and the need to maintain the granular surround for support, had made repair of the bursts extremely difficult and costly. It was, therefore, decided that the new mains would be laid with a centre line to centreline separation of five metres,

Phase two, replacement of the two larger GRP mains, each approximately 550m long, used short sleeve welded steel pipe with internal and external "Scotchkote 206" (fusion bonded epoxy) protection. Sacrificial cathodic protection was installed to further enhance corrosion protection.

Installation of the new steel mains within the high lift pumping station presented a series of unique problems. The treatment works had to remain operational at all times, with each separate pumping system shut down for only a few hours at a time. These problems were further exacerbated by the difficult access arrangement and the need to lift all new pipes into position using both the existing lifting beams and new temporary lifting arrangements. These were

designed and installed by the contractor. Extensive planning and coordination was required to facilitate this operation.

Three new openings were formed through the external walls to the pumping station to accommodate the new mains. Due to the size of these openings it was necessary to check the effect of these on the structural integrity of the wall. Also, due to space limitations, it was necessary to house the new isolation valves in an external chamber, this was designed so that there is no transfer of thrust forces onto the existing structure.

Connections to the two existing pre-stressed concrete mains required careful planning with the specialist fittings supplied from *Saint Gobain*. Detailed site measurements were undertaken and investigations carried out to ascertain the pressure rating of the existing pipe, to allow for the correct design of the fitting prior to fabrication.

Design of the connections also had to take into account the ease of construction to limit the downtime of each main. The programming and phasing of this work was undertaken in conjunction with the client to lessen the impact of the works to the system as a whole. Risk assessments and contingency plans were formulated prior to approval being granted to complete the connections.

All three of the new mains are now operational providing Severn Trent Water with a robust and secure pumping system at Melbourne WTW. ■

Note: *The author of this article, James Dawes, is Group Engineer, Haswell Consulting Engineers.*



Melbourne WTW: Installation of welded steel pipe

courtesy Haswell Consulting Engineers & Severn Trent Water