

Great Yarmouth (Northgate Street) Flooding Alleviation Project

by
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The project consists of a large diameter overflow sewer, pumping station with wet well storage and rising main, installed to alleviate flooding in the Northgate Street area of Great Yarmouth in Norfolk. The existing local sewerage system serves a population of approximately 8,355, which suffered extensive flooding in September 2006 when about 300 properties in Great Yarmouth were flooded during a 1 in 96 year storm. The project was given formal client approval in July 2008 for completion in March 2009.



Pumping station wet well

Courtesy of the @one Alliance

The improvements will provide additional sewerage capacity by taking flows away from this area, to the existing New Tar Works Pumping Station (PS) from where they will pass to Caister Wastewater Treatment Works or be spilled to the tidal River Bure via an existing overflow. The improvements will protect properties from a 1 in 30 year storm taking into account possible future climate change, which, means that initially a significantly higher protection, nearer to 1 in 100 years, is being provided.

Solution

The challenges of the project include a very tight timescale, space and traffic constraints within a well-developed urban area, existing services, ground conditions and very sensitive public relations.

Flows in excess of the existing sewer capacity spill via weirs at two locations into a 255m long 1.5m diameter sewer in Northgate Street. This takes flows to the new Northgate Street PS from whence they are pumped to the existing New Tar Works PS. The Northgate Street PS provides 860m³ of storage, which in itself provides capacity for

1 in 5 year storm flows without the pumps.

The 1.5m diameter sewer has been installed by pipejacking, rather than by open cut, a decision taken early on due to the high water table, sandy ground, location of existing services in the road and to minimise disruption to customers and traffic. This has required careful location of shafts in order to avoid the need for service diversions, which resulted in the decision to work with only two shafts, which was taken due to confidence that the maximum pipejacking drive could be increased to the full 250m without the need for an intermediate shaft.

The pumping station wet well, 10.5m in diameter and 13m deep, was constructed by sinking a caisson - the construction team's preferred technique. The adjoining 5.2m by 4.6m valve chamber was formed from pre-cast panel sections.

Pumping capacity is provided by two 250kW NP3400 pumps delivering 570l/s flow at 29m head.

The pumping station discharges into a 600mm diameter rising main 450m long to New Tar Works PS. The rising main has been installed by a combination of pipejacking for the road junction and allotment crossings, with open cut used for the shallow ductile iron pipe laid during a road closure. Initially it was proposed to install a pressure lining within the pipejacked length as the joints were not designed to take high pressures. However, tests have shown that the supplied joints can adequately take the lower pressures in those lengths of the main, resulting in a saving of £160k.

A key aspect of the project has been the way that the detailed design was developed jointly with the design and construction teams. This was important for two reasons. Firstly, the selection of the construction techniques for gravity sewer, pumping station and rising main was fundamental to the development of those designs. Secondly, the tight timescale did not allow time for service diversions for either shaft sinking or pipelaying. It was therefore crucial to refine the design to avoid that need.

The design process was conducted with weekly design review meetings with both teams during the two months available for design, following project approval in July 2008. During this time, extensive trial holing was undertaken to locate existing services and to enable details of shaft locations to be confirmed. An extensive site investigation was undertaken with boreholes at each shaft location due to the variable ground conditions. This approach allowed a construction start to be made in early October, when shaft sinking for the main pumping station and the rising main drives was started.

Undertakings

The work was undertaken by the @one Alliance, a collaborative organisation comprising Anglian Water Engineering, Balfour Beatty Utility Solutions, Barhale, Biwater Treatment Ltd, Black & Veatch, Grontmij and Skanska-Aker Solutions, which was set up in 2005 to deliver a large part of Anglian Water's AMP4 capital investment programme.

The union of these companies brings together a wealth of experience, which is being used to enhance and increase Anglian Water's assets and infrastructure, providing innovative and sustainable solutions and the best value to customers. By doing so, the @one Alliance is helping Anglian Water fulfil its current supply and treatment obligations as well as make provisions for the increase in demand expected in the future.

Completion

The project has now been completed. The pumping station was available to take flows at the end of March 2009, the target date. The outturn cost was well within budget, although part of the risk provision was used when substantial strengthening of the main tunnel drive shaft was required. The project has been well received by local residents, who value the improved flooding protection now provided. The local MP has also commented it on very favourably.

Note: *The Editor and Publishers wish to thank the author Dave Chadwick, a Sub-Programme Delivery Manager of the @one Alliance, for preparing the above article.* ■



Tunnel break through

Courtesy of the @one Alliance