

Hornsea & Mappleton UWWTD schemes

new treatment works, pumping stations and outfalls

by Nick Szutenberg, BEng, CEng, MICE, MICWEM

Hornsea, a seaside resort on the east coast of Yorkshire has a resident population of 8,500 which can rise to 25,000 PE during the most popular holiday weekends. At present, crude sewage from Hornsea is collected into a large pumping station situated on the town's foreshore, screened and discharged via a long sea outfall of plastic pipe construction which has been subject to flotation problems in the past. Storm flows are discharged into a short sea outfall. Crude sewage from the nearby coastal village of Mappleton is discharged to sea via a short sea outfall. As part of Yorkshire Water's 'Pride in Yorkshire's Coastline' programme, a scheme is underway to ensure Hornsea bathing waters comply with the Bathing Waters Directive and its waste water discharges comply with EC Urban Waste Water Treatment Directive. The project is the combination of two schemes.



Hornsea: Sea outfall thrust bore (Courtesy Earth Tech Engineering Ltd)

The Hornsea Scheme consists of:

- * a new pumping station and storm water detention tank at the foreshore in Hornsea, adjacent to the existing pumping station. The detention tank is required to restrict the frequency of spills during the bathing season to meet Environment Agency requirements;
- * flow transfer pipelines to carry wastewater to and from a new Hornsea Waste Water treatment works to provide preliminary primary and secondary treatment followed by UV disinfection. The works is sited on a greenfield site 3.5km south of the town;
- * two new sea outfalls at the Hornsea foreshore; one for treated effluent from Hornsea WwTW, and one for storm overflows from Hornsea PS.

The Mappleton Scheme consists of:

- * a new sewage pumping station and underground transfer pipeline to Hornsea WwTW;
- * 6mm storm screen at the existing sea outfall.

Planning & environmental issues

The environmental impact of the scheme has to entail no residual adverse impacts. Detailed planning permission was granted only after a lengthy process involving the preparation of an Environmental Statement. Due to the high visibility and sensitive nature of the scheme, quality building finishes and landscaping features intended to reflect the agricultural environment are a specified planning condition.

Procurement

Contract for the scheme was awarded to the *Earth Tech – Morrison JV* following a competitive tendering procedure using main contractors drawn from Yorkshire Water’s framework list for major projects. The contract is on a fixed price turnkey basis using the NEC Engineering and Construct Contract form. *Morrison Construction Ltd* are Principal Contractor, responsible for project and site management and all construction activities. *Earth Tech Engineering Ltd* are the Designer responsible for design, mechanical and electrical plant procurement and commissioning activities. The project is supervised and administered on behalf of the client by *Montgomery Watson Harza*.

Hornsea foreshore PS & sea outfalls

The new foreshore pumping station will be located adjacent to the existing pumping station to transfer flows for full treatment (=3 DWF) to the treatment works. Flows in excess of this will be screened to 6mm and will spill into a 700m³ storm water detention tank. The pumping station is being constructed as a circular shaft from circular bolted section panels, being 12.5m diameter and 14m deep.

The detention tank will house large storm pumps capable of passing a total flow of 3000 l/s down a new 1200mm diameter sea outfall, when the tank is full. This equates to a 1 in 30 year storm event for the Hornsea catchment. A separate 350mm diameter outfall is being laid alongside the storm outfall for treated effluent. Both outfalls are 500m long. The outfalls are being constructed by *Van Oord Ltd*, using a method wherein the concrete coated steel pipelines are assembled in strings on the foreshore and pulled from sea into a dredged trench.

Odour control measures will be incorporated at the pumping station. A septicity control system will be provided to control septicity in the rising main to the WwTW.

Hornsea Wastewater treatment works

The works is being constructed in farmland in an environmentally and visually sensitive area. It will, in general, comprise the following:

Inlet works

Two rising mains from the Hornsea Foreshore PS and Mappleton PS will enter the inlet works screen chamber housing two 6mm screens. A by pass channel will be provided complete with manually raked 10mm bar screen. Removed screenings will be washed and dewatered in duty/standby compactors to ensure they are clean of organic and faecal matter. Grit will be removed from the screened wastewater in a hydrodynamic separator, washed of all organic matter and drained of all free draining liquid. The inlet works structure, screenings skip, grit separator and grit skip will be covered and connected to an odour control plant.

Primary settlement

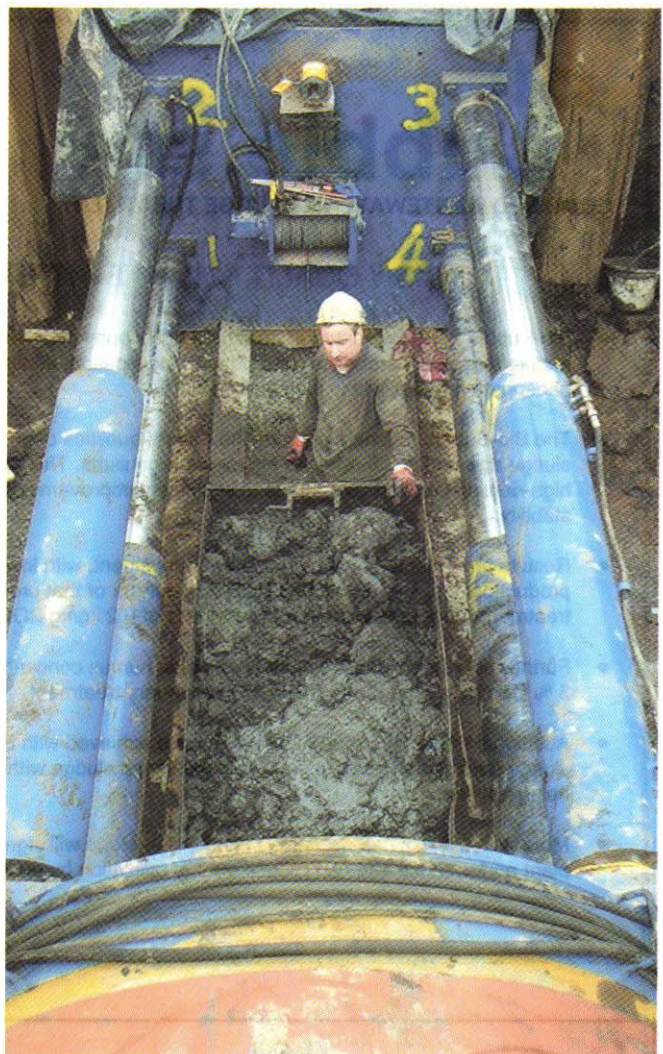
Two 15m diameter primary settlement tanks will be provided and provision will be made to allow these tanks to be bypassed to allow the flows to be passed directly to the aeration plant selector chamber, in order to provide flexibility in dealing with the wide variation between winter and summer loads.

Aeration system

A selector zone and three 50% duty aeration lanes, each 20m x 4m



Hornsea: Sea outfall thrust bore (Courtesy Earth Tech Engineering Ltd)



Hornsea Pumping Station (Courtesy Earth Tech Engineering Ltd)

x 5m deep, are being constructed. Each aeration lane will be served by a dedicated variable speed blower. A standby blower will be provided. Each lane will be aerated by fixed fine bubble aeration grids of flexible membranes. Each aeration lane will have two DO probes operating on a duty/standby basis.

Final settlement tanks

Effluent will flow by gravity from the aeration lanes to the two 18m diameter final settlement tanks. Returned activated sludge will be removed from the final settlement tanks on a continuous basis by variable speed submersible type centrifugal pump. Surplus activated sludge will be removed from the final settlement tanks on an adjustable run/dwell basis by fixed speed submersible type centrifugal pumps.

Ultra Violet treatment

Effluent from the final settlement tanks will flow by gravity to the two 100% capacity UV disinfection treatment systems, which will be arranged to operate with one system in normal operation with automatic changeover to a stand by bank. This system is being provided by *Wedeco Ltd*.

Final effluent PS

Final effluent pumps will be fixed speed and operate as duty/assist/standby to transfer the effluent flows to the North Sea through the new sea outfall at Hornsea,

Sludge thickening

Two sludge drum thickeners supplied by *Alfa Laval* will be provided to treat separately primary and SAS sludges. Thickened

sludge at 6% dry solids is stored for a maximum of ten days on site before being transferred to the regional sludge treatment centre at Hull.

Mappleton

All combined sewage from the Mappleton sewerage system will gravitate via a new interceptor sewer into a new sewage pumping station for pumped transfer to the WWTW. A septicity control system will be provided to control septicity in the PS and rising main. Odour control measures will be provided at the pumping station. A new combined storm overflow chamber will be provided upstream of the sewage pumping station to discharge storm flows through the existing Mappleton outfall. The chamber will be fitted with a suitable self cleaning 6mm screen.

Progress

The contract was awarded in August 2001. Work commenced on site in October 2001 and the plant is due to be handed over to the client in April 2003. Construction of the Hornsea PS shaft has been successfully completed in extremely poor ground conditions by specialist sub contractor *Fineturret Ltd*. Work is progressing well at the WWTW site where circular settlement and sludge holding tanks have been constructed by sub contractor *Galglass Ltd* using a proprietary formwork system which has proven to be both speedy and economic. In accordance with the NEC contract conditions, the project is being executed in a spirit of mutual trust and confidence and is forecast to be completed on time and within budget. ■

Note: *The author of this article, Nick Szutenberg is Project Manager with Earth Tech Engineering.*
