

Bridlington Stormwater Outfall

Yorkshire Water's 1.25km long sea outfall, part of the works to achieve 'excellent' bathing water standards for Bridlington beaches

by Mark Doherty & Noel Feather CEng CEnv FCIWEM MICE

Bridlington is a major holiday resort on Yorkshire's east coast. Both its North and South Beaches are officially designated as bathing beaches and have had Blue Flags in the past. However the revised Bathing Water Directive (rBWD) introduces more stringent water quality standards for designated bathing waters from 2015. Yorkshire Water Services (YWS), in partnership with the Environment Agency, Scarborough Borough Council, East Riding of Yorkshire Council, North Yorkshire County Council, the National Farmers' Union and Defra, have committed to achieving the new 'Excellent' standard for eight beaches in the Yorkshire region, including the beaches at Bridlington. The Bridlington rBWD scheme involved two principal contracts, onshore works and a new long sea outfall. Scheme development and progress on the construction works was included in UK Water Projects 2014. This case study focusses on the long sea outfall which was installed in June 2014.



Aerial view of the Bridlington long sea outfall pipeline being aligned above the pre-dredged trench - Courtesy of Peter Smith Photography



Aerial view of Bridlington. The harbour separates the designated North and South Beaches - Courtesy of Peter Smith Photography



View of Belgrave Road Pumping Station and replacement toilet block - Courtesy of Arup



Large diameter HDPE pipelines being extruded directly into the fjord from Pipelife's Stathelle plant - Courtesy of Arup

Bridlington rBWD

The Bridlington rBWD Scheme involved two principal sets of improvement works. Firstly it was necessary to increase the maximum wastewater flows which are given full treatment. The key elements of the project to achieve this are:

- An extension to the existing Headworks Pumping Station building.
- New pumps and facilities for operation and maintenance.
- Provision of additional treatment capacity at Bridlington WwTW.

The second, more significant, requirement was to significantly reduce stormwater discharge into the watercourses and inshore bathing waters. This necessitated the following:

- New Combined Sewer Overflow (CSO) with fine screening at Springfield Avenue.
- A 2.1m diameter underground tunnel to transfer storm water from Springfield Avenue and two other CSOs to the promenade.
- A new storm water pumping station on the Spa Promenade (Belgrave Road Pumping Station).
- A new long sea outfall (the focus of this case study).

Construction contracts

The scheme was divided into three design and construct contracts, with the offshore works contract awarded to specialist marine contractor, ABCO Marine. The onshore works were undertaken by one of Yorkshire Water's framework contractors Morgan Sindall Grontmij Joint Venture (MGJV) with separate contracts awarded for



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THE RESULT

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the Bridlington WwTW capacity enhancement and the remaining Onshore Works in the town.

Arup were Yorkshire Water's technical consultants undertaking the scheme concept design and developing this through public consultation, planning approval and outline design. Financial Consultants for the project were Turner & Townsend.

Pipeline

The 1.25 km long, 2.0m external diameter, HDPE pipeline was procured directly by Yorkshire Water under a new framework agreement with Pipelife Norge AS.

The pipeline was produced at Pipelife's Stathelle plant near Oslo. The main pipe, in two lengths of approximately 600m, was continuously extruded directly into the fjord adjacent to the factory. It took almost a month of continuous extrusion to produce the required length.

Teesside

ABCO established a temporary works yard at Teesport to receive the two pipe lengths from Norway. In Norway the pipe sections were prepared for towing across the North Sea. Each length was sealed and the two lengths were towed together by a tug across the North Sea and delivered to the contractor's yard at Teesport in July 2013.

At Teesport the pipe was prepared for towing to Bridlington and sinking into a pre-dredged trench. To reduce buoyancy concrete weight collars were added to the pipes and the sections of pipe were joined together into a single 1,250m length.

ABCO Marine supplied 335 (No.) specially designed precast concrete collars and concrete kennels. Each collar weighing approximately 12 tonnes was supplied in two sections and then bolted around the pipeline. The collars were fabricated in Northern Ireland and delivered by ship to Teesport and unloaded at the works quay. The onshore section of the outfall pipeline, which during operation may fill with air, was further ballasted down with 55 (No.) precast concrete kennels each weighing 13.35 tonnes. These kennels were delivered direct to site in Bridlington and fitted following the successful installation of the outfall pipe in the pre-prepared trench.

Beach/marine trench works

To facilitate the outfall pipe installation across the beach in Bridlington, a temporary cofferdam was constructed using two rows of 5m deep steel sheet piles from the sea wall down approximately 350m down the beach to the low water mark. The cofferdam utilised over 1,000 tonnes of steel piles, 70 tonnes of steel waling beams and 130 (No.) high strength anchor bars.

The onshore pipe trench was excavated between the two rows of piles. The remaining 900m of the marine trench out to the discharge point was completed by specialist marine dredge plant with GPS guided excavators on board.

Pipe sink and backfilling

Unfortunately due to weather and other delays, installation of the pipeline in the marine trench could not be achieved prior to the onset of winter weather in the 2013 season. Consequently the marine equipment was stood down over the winter period and the pipeline safety anchored in the River Tees.

The contractor remobilised in May 2014 and prepared the pipe trench for the arrival of the pipeline from Teesside. Once the pipe trench was ready and the outfall pipe string had been prepared for the tow, the critical planning element was the requirement of a suitable weather window for the pipeline tow and sink operation.

The marine pipeline tow was a 55 nautical mile tow down the Yorkshire Coast from Teesport to Bridlington's South Beach. A



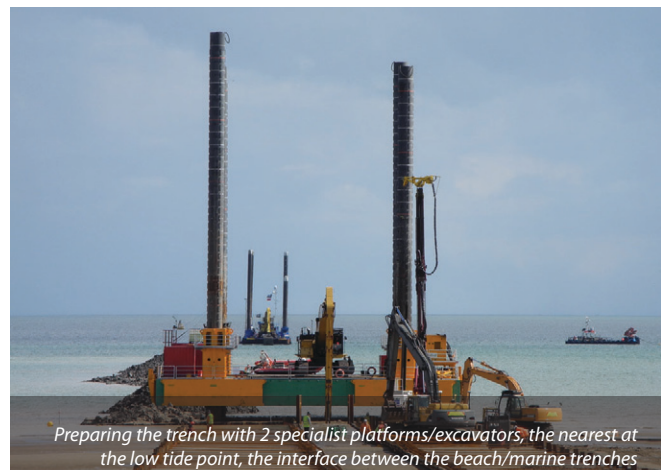
Pipeline arrives in Teesport following its tow across the North Sea from Norway - Courtesy of Peter Smith Photography



Concrete weigh collars being attached to the pipeline in the River Tees - Courtesy of Arup



Excavating the beach trench between two rows of steel sheet piles with anchor bars and anchor piles clearly visible - Courtesy of Arup



Preparing the trench with 2 specialist platforms/excavators, the nearest at the low tide point, the interface between the beach/marine trenches

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PipeLife Norge AS is the Norwegian subsidiary of the Vienna based PipeLife Group. Its production facility in Stathelle, Southern Norway specialises in manufacturing larger diameter, solid wall, PE pipes in diameters up to 2500 mm OD in lengths of up to 600m long.

The pipe is continuously extruded into the sea in a sheltered fjord. The pipe ends are sealed off with flange connections and blank plates, or with PE end plugs. It is then towed to site using ocean going tug boats.

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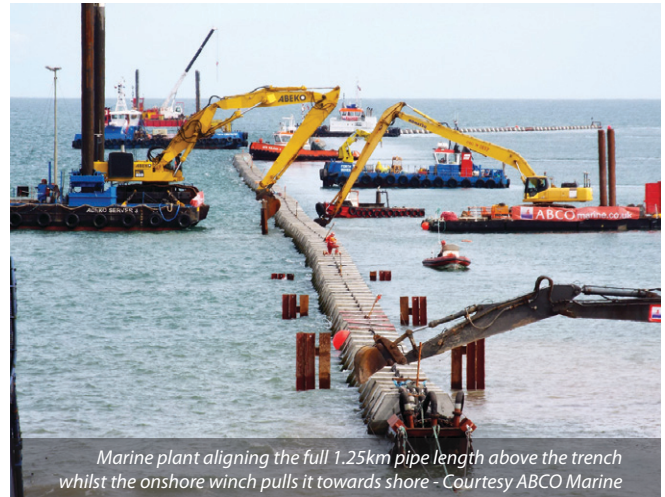
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Lead tug, 'Ormesby Cross', towing the pipeline from Teeside to Bridlington at first light on 24 June 2014 - Courtesy of SMC



Marine plant aligning the full 1.25km pipe length above the trench whilst the onshore winch pulls it towards shore - Courtesy ABCO Marine

suitable weather window materialised on 24 June 2014 when towing of the 4,500 tonne, 1250m long structure commenced. It took the lead tug, the *Ormesby Cross*, over 36 hours to reach Bridlington. In addition to the lead tug there was a stern tug and several safety and scouting vessels accompanying the tow.

Once the pipeline reached Bridlington Bay it was maneuvered near to the shore so that an onshore winch line could be attached. The winch brought the head of the pipeline up the trench within the cofferdam to the sea wall. Throughout this operation the support vessels kept the pipe aligned over the trench. When the pipe was aligned and the tidal conditions were correct the pipe was gently sunk into the trench by initiating the sink and pumping water from offshore whilst releasing air from within the pipeline inshore, monitoring the flow to control the rate at which the pipe was sunk. This was successfully achieved in the early hours of 26th June 2014.

A single large diffuser section was fitted to the offshore end of the pipeline to discharge and disperse the stormwater at the offshore end of the pipeline. The marine and beach trenches were then backfilled and the piling removed to return the beach to its original condition.

Conclusion

Following connection of the outfall pipeline to the onshore storm water pumping station and connecting tunnel it now carries up to 7,500 litres per second of stormwater out to sea with the aim that Bridlington beaches will achieve the converted Blue Flag status.

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Pipeline tow complete and being held in position awaiting high tide and commencement of the sinking - Courtesy of Arup