

# Land's End North Sewage Treatment Scheme

## £6.7m project gives first time treatment for historic mining area

by Steve Cross & Dominic Lovell BEng (Hons), CEng, MICE

**T**he communities of St Just, Botallack, and Pendeen are located on Britain's most westerly point on the Land's End Peninsula, Cornwall. These communities are renowned for their historical tin mining activities and have been some of the most intensively mined areas in Cornwall. Although the mining has now ceased the industrial heritage means that the landscape has been designated an Area of Great Historic Value, is a candidate Special Area of Conservation, and is being considered as a World Heritage Site. In addition, much of the countryside in this locality is designated an Area of Outstanding Natural Beauty, Heritage Coast and there are also many areas designated as Sites of Special Scientific Interest.



STW in Nancherrow Valley, Tregeseal

*courtesy South West Water*

The challenge for South West Water (SWW) was to provide first time sewage treatment for St Just, Botallack and Pendeen. The communities of Botallack and Pendeen with population equivalents of 400 and 2850 respectively have no sewage treatment facilities and discharged crude sewage to the Atlantic Ocean via two outfalls at the base of the cliffs. St Just, with a population equivalent of 2,100 required first time sewage treatment for the western part of the town with untreated flows being discharged via an outfall adjacent the beach at Porth Nanven, Cot Valley.

### Scheme drivers

The original scope agreed between South West Water and the Environment Agency, under the National Environment programme, was to provide three separate projects to meet the requirements of the Urban Wastewater Treatment Directive. For St Just and Pendeen secondary treatment was required. For Botallack only screening was required.

At the development stage it became apparent that cost and environmental benefits could be achieved by combining all three

schemes and, therefore, a single sewage treatment works (STW) was progressed as the preferred option. A single STW also had long-term operational benefits compared with separate solutions.

### Transfer of flows from St Just

The eastern part of St Just already had a dedicated sewage treatment plant located in Nancherrow Valley, Tregeseal. There was no requirement to improve this asset, however, there was scope to provide a new sewage treatment works at this location.

Flows from the western part of St Just gravitated to the existing Cot Valley outfall. These flows were intercepted by new sewerage and were designed to gravitate to the new STW located adjacent to the existing STW at Tregeseal. Pass forward flows from the St Just catchment were limited to 6 DWF (22 ls) by use of a Hydroslide, provided by *Copa*. Flows gravitated to the STW via a 1.5km long pressure pipeline.

A pressure design was utilised so as to enable the STW to be isolated in the event of problem/failure. The watercourse adjacent



Refurbishment of existing pumping station at Geevor

*courtesy South West Water*

to the STW was deemed to be too sensitive as a receptor for CSO or emergency discharges. Therefore, the provision of storm attenuation and CSO at the works was not a viable option. The St Just pipeline was designed so that it could be isolated by a penstock at the inlet works forcing flows to back-up in the pressure sewer and spill via an upstream CSO/storm tank to the existing Cot Valley outfall. A CSO discharging to the existing Cot Valley outfall made use of existing assets and was deemed to be a better environmental solution than discharging to the more sensitive watercourse adjacent to the STW.

#### **Flow transfers from Botallack**

Under the National Environment Programme the original requirement for Botallack was limited to the provision of fine screening. After negotiations with the National Trust (land owners) a small pumping station was provided which pumped 6 DWF (6.4 l/s) directly to the STW for full treatment. The pumping station was provided with storm attenuation and a screened CSO/EO to the existing outfall. The pumping station was sympathetically landscaped and was enclosed within a Cornish Hedge. The control kiosk was built from locally excavated stone.

#### **Transfer of flows from Pendeen**

The area between St Just and Pendeen forms part of Cornwall's oldest mining area. None of the mines are now in use as working mines. However, the heritage of previous mining activity is still evident.

At Pendeen, Geevor Tin Mine, Europe's largest preserved tin mine is now a popular tourist attraction. The mine is open to the public as a museum with an underground tour.

The existing drainage network for the Pendeen catchment gravitates through Geevor Tin Mine to an outfall which discharges at the base of the cliffs. Any proposal to intercept the existing

sewers needed construction within the Tin Mine which presented a number of challenges.

The most difficult aspect of the proposals at the mine was ensuring that any works were in keeping with the mining heritage. To make matters more complicated the mine also forms part of the 'Cornwall and West Devon Mining Landscape World Heritage Site Bid' Any redevelopment within the site has to be sympathetic.

Due to the layout of the existing infrastructure, the most appropriate solution for Pendeen was the provision of a new pumping station somewhere in the mine, to transfer flows to the new STW some 3.5kms to the south. Following negotiations with the trustees of the heritage site and Cornwall County Council an existing disused pumping station within the site was offered as a solution for the new pumping station location. Adjacent to the pumping station there was a very useful reinforced concrete settlement tank (also disused) with a total volume of approximately 800m<sup>3</sup>.

A structural inspection of the settlement tank was undertaken and it was deemed that the integrity of the tank, as a water retaining structure, could not be guaranteed. However, the structure was still a valuable asset and was used to house two prefabricated GRP storm water attenuation tanks with a total volume of 250m<sup>3</sup>. This storage volume was sufficient to allow a reduction in the pass forward flow rate from pumping station from 6DWF (30 l/s) to 3DWF (16 l/s) without compromising the predicted annual storm flow volume. This reduction in the pass forward flow rate also reduced the size of the process plant at the STW with associated cost benefits.

The pipeline route between the pumping station at Geevor mine and the STW, 3.5kms to the south was aligned to avoid known mine shafts and environmentally designated areas. The pipeline route

within the mine was particularly sensitive as this had to avoid the underground tour and it also had to span several adits and capped mineshafts.

**Sewage Treatment**

South West Water owned an existing STW in Nancherrow Valley, Tregeseal which served part of St Just. The new works is located adjacent to the existing and consists of an activated process plant with a design capacity of approximately 5400 pe. Flow to full treatment is 44 l/s. The effluent will be treated to meet a consent of 40mg/l BOD: 60 mg/l SS.

The process consists of an inlet screen, anoxic tank, compact plant (extended aeration lane and final settlement tank combined), odour control, sludge thickener, and a final effluent pumping station. The final effluent is pumped back to the existing Pendeen outfall at Geevor Tin Mine. Activated odour treatment is also incorporated into the scheme to meet the strict planning conditions. Thickened sludge is stored in an 80m<sup>3</sup> tank and is tankered to SWW’s sludge treatment facility at Hayle STW for further treatment.

The site of the STW is adjacent to a local stream and within an indicative 100 year flood plain confirmed by a Flood Risk Assessment undertaken by *Hyder Consulting*. The layout of the STW had to be significantly engineered to mitigate the impacts on the flood plain and was squeezed into a narrow configuration above the 100 year flood level. As agreed with the Environment Agency, the main process equipment had to be designed with a threshold above the 100 year flood level so that the STW remained operational at all times.

To help reduce the footprint of the STW a ‘compact plant’ was utilised. The compact plant consisted of an outer annulus (22m dia) aeration zone with a central final settlement tank ( 14m dia). The structure was constructed using pre-cast, post tensioned concrete panels. These panels were used for the construction of both the compact plant and sludge holding tank.

**Archaeology**

A planning condition set by Cornwall County Council required an archaeological watching brief during the construction of the pipelines. On one of the watching briefs the council’s archaeological unit uncovered charcoal, burnt stones and four beakers which dated back to the bronze age. This was an exceptionally rare discovery and the beakers were attributed to a group known as the “Beaker People”. The find suggested that the so called Beaker People occupied the site for a considerable period whilst searching for tin and copper ore. The discovery of these significant archaeological finds resulted in the pipeline being diverted to avoid any future disturbance.

**Scheme benefits**

The scheme provides first time sewage treatment for Pendeen, Botallack and the western part of St Just and results in the cessation of crude sewage discharges at three outfalls. Discharge of the treated effluent to the remote and inaccessible outfall west of Pendeen avoids the more sensitive and accessible area at Cot Valley (which was also considered as a possible effluent discharge location during the scheme development).

The original treatment standard for Botallack was improved from fine screening to secondary treatment as a consequence of the adoption of a regional scheme.

**Project status**

The planning application was submitted to Cornwall County Council in July 2004 and approved in mid February 2005. Construction started in May 2005 and the project was partially

completed December 2005, when the St Just and Botallack catchments were brought on line. The pumping station at Geevor Tin Mine was completed in March 2006 following detailed negotiations with Cornwall County Council. The scheme is now fully operational and complying with the consents.

**Partnering**

The project was undertaken as part of a partnering arrangement to deliver South West Water’s AMP3 Capital Programme. The partnership consisted of the following organisations:■

**Client:** South West Water Ltd; **Civil Contractor:** Alfred McAlpine Capital Projects; **Process Contractor:** Biwater Treatment Ltd; **Civil Designer:** Hyder Consulting (UK) Ltd.

**Note on the authors:** *Steve Cross is Project Leader, South West Water Ltd; Dominic Lovell is Design Manager for Hyder Consulting (UK) Ltd.*

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**Lands End North Sewage Treatment Scheme**



We are pleased to have prepared the Environmental Report for the successful approval of Lands End North Sewage Treatment Scheme for South West Water.

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- Planning Appeals and Expert Witness
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