

# Skinninggrove Sewage Treatment Works

## Northumbrian Water's new STW for sensitive NE coast area

by

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**S**ewage from the villages of Skinninggrove, Loftus, Liverton, Carlin How, and Easington, on the North East coast, with a population equivalent of just over 11,000 currently discharges untreated through a short sea outfall at Cattersty Sands, Skinninggrove. The discharge point is approximately 30m beyond Mean Low Water Mark (MLW) but is often exposed at low tides. To comply with requirements of the Urban Wastewater Treatment Directive (UWWTD) Northumbrian Water Ltd (NWL) is obliged to upgrade the sewerage system and provide secondary treatment for flows up to 3DWF (82 l/s), attenuation and screening for storm flows and a 200m long extension of the existing sea outfall to improve dispersion.



Skinninggrove STW: Under construction

courtesy Northumbrian Water Ltd

### Site selection

The site for a new STW in any area is an emotive subject, especially so at Skinninggrove in an area designated a Heritage coast and a Coastal Special Landscape Area. Although Cattersty Sands is not currently designated as a Bathing Water, the coastline has significant recreational value to the local community and visitors. The area is very scenic and is popular with walkers on the Cleveland Way.

As there was no obvious or environmentally acceptable area available near the lower end of the sewerage system, a site selection survey was initiated which identified 10 possible sites, the best of which was an area of reclaimed industrial land on a plateau to the west of Skinninggrove. However, as this was one of the few available flat areas used by local 'dog walkers' and within 200m of houses, there was much local opposition.



Skinningrove: Pumps have highest head 87ft of any single stage pumping station in UK

courtesy Northumbrian Water Ltd



Skinningrove: Cliff top STW

courtesy Northumbrian Water Ltd

Subsequent discussions with Corus, former owners of the preferred site, led to the offer of a site wholly within the Corus steelworks boundary, further from houses and less visible.

This site has the additional advantage of a ready made access road, but is at an elevation of approximately 70m above beach level.

Following a period of public consultation, a planning application for the 'Corus' site was approved in March 2003.

## Scheme summary

The new project can be summarised in four parts

- a new relief sewer through Skinningrove to provide additional capacity and prevent foul sewage from discharging to nearby Skinningrove Beck;
- \* a pumping station located at the sea front car park, to transfer sewage flows from the village to the site of the treatment works;
- a new sewage works to provide secondary treatment to standards set out in the UWWTD;
- \* a 200m extension to the existing sea outfall, buried in a trench cut into the rock of the sea bed.

## Relief sewer

As Skinningrove is at the end of a cul de sac, along a steep sided valley, a new open cut sewer would have required on line replacement along the main street and would have effectively closed the village for three months. Tunnelling solved many of the problems of dealing with services, maintaining access for residents and emergency services and maintaining flows in the sewerage system.

The relief sewer was built between January and May 2003. There were two tunnelled sections, 242m long and 44m long respectively, both at 1000mm diameter, in mixed sands, gravels, shales and mudstones at depths up to 10m.

Tunnelling was done by remote controlled Herrenknecht AVN 1000. A high degree of accuracy was required where the drive passed within 50mm of the existing sewer and within 1.5m of house foundations. Spoil from the tunnel was retained for future use extending the beach car park.

## Transfer pumping station

The transfer pumping station is located between the beach and a grassy cliff, on an area previously used as a car park. The TPS provides foul pumping to the STW, storm pumping via a header tank to the outfall, screening of storm flows and storage and attenuation of flows up to a 1 in 1 year storm.

The substructure containing pumps and storage is a 13m diameter caisson built by under pinned shaft segments Screen, header tank and electrical controls are housed in an adjacent building, clad in stone to match the local vernacular.

**Foul pumps are provided by Grundfoss, with a capacity of 81 l/s at 87m head. This is the highest head of any single stage sewage pumping station in the UK.**

**The rising main to the STW and the returned treated effluent are laid in the same trench initially along the Cleveland Way and then up a 1 in 4 ramp to the top of the cliffs.**

The original car park has been redesigned and rebuilt adjacent to the Cleveland Way in conjunction with Redcar and Cleveland District Council.

## Sewage treatment

The STW is built on a slag tip laid down in the early 1900s by the local steel company, now *Corus*. Initial site investigation indicated a risk of fused slag in massive lumps so the construction strategy was to keep the treatment units out of the ground to minimise excavation. However, this conflicted with the desire to minimise visual impact, so a compromise design of terracing and burying was reached. All spoil was used to construct screening mounds.

The STW was conceived as a 'traditional' works with inlet screens, grit removal, primary settlement and biological treatment in percolating filters for low running costs, operational reliability and simplicity.

Preliminary treatment is a *Huber* package plant mounted on a flat slab, providing screening to 6mm and grit removal. Screenings and grit are discharged to skips via compactors/chutes and wrapped in polythene sausage.

The PSTs and FSTs are both 10m dia., using the same prefabricated wall shutters. The tanks were designed to suit existing shutters owned by the contractor.

There are two percolating filters, 18m diameter x 2.4m deep, packed with plastic media, which increases efficiency and substantially reduces cost and land requirement.

Sludge is removed from the PSTs by positive displacement pumps and passed first to a picket fence thickener and then to a seven day capacity sludge storage tank.

Secondary sludge is returned for co-settlement with the primary sludge. Air is extracted from the inlet works and sludge processes and passed upwards through one of the percolating filters to remove odours.

## Outfall extension

The existing 450mm diameter cast iron outfall has been repaired and cleaned out prior to being extended.

The new 500mm diameter polyethylene extension is trenched into the rock of the seabed and backfilled to preserve conditions for the local fishermen.

Treated effluent and screened storm flows discharge via 2 x 300mm dia flexible diffusers with a third in reserve.

## Procurement and programme

The relief sewer and civils work for the STW and Transfer PS were both built by *Byzack*, NWL's framework contractor on separate open book ECC Option C contracts with target cost.

The M & E work for the STW and TPS are being carried out by *Meica*, again on open book EEC Option C contract with target cost. The relief sewer was completed in May 2003, paving the way for the STW and Pumping Station to start in July.

Installation of M & E equipment started in March 2004 and is programmed for completion in July 2004 so that consent standards can be met by the end of August.

**The project is on programme and comfortably within the budget of £8.2m. ■**

**Note:** *The author of this article, Alan Thomson, is Project Manager, Northumbrian Water Ltd.*