

# Dawdon Minewater Treatment Scheme

## innovative aquifer protection scheme in County Durham

by  
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**T**he Dawdon Minewater Treatment Scheme has been commissioned by the Coal Authority to prevent irreversible pollution of the East Durham aquifer by iron and chloride rich minewater. The aquifer provides drinking water to Sunderland and the surrounding communities. The scheme also complements the Durham Heritage Coast 'Turning of the Tide' project which has remediated the legacy of pollution caused by historic mining to create an attractive coastal environment.



Pipeline installation

Photo courtesy of JN Bentley

### Background to the Scheme

The mass closure of collieries in the area in the early 1980's resulted in the cessation of pumping of minewater from the underground workings. As a result minewater in the abandoned workings recovered, posing a threat of contamination to the overlying aquifer, a significant asset for potable water abstraction supplying the Sunderland area. There is also the threat of minewater emissions polluting the East Durham coastline and the River Wear.

The long-term solution involves pumping minewater from the Dawdon mine shaft to control underground minewater levels. A hydrogeological study of some 125 km<sup>2</sup> of interconnected mine workings was carried out in order to determine the optimum position for the pumping. The minewater then needed to be treated prior to discharge to sea.

The highly saline nature of the minewater (up to 40,000 mg/l) meant that a bespoke High Density Sludge process design had to be developed. This is the most complicated minewater treatment scheme to be constructed in the UK, with several unique facets.

The scheme involves the construction of the following:

- Twin borehole pumps suspended 100m down the Dawdon shaft.
- Twin 800m long rising mains, including auger bored road and rail crossings.
- Treatment building, housing the active treatment process and support accommodation.
- Gravity discharge main.
- Twin directionally drilled short sea outfalls.

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Winners of their last two annual Environmental Performance Awards, we're delighted to have strengthened our relationship further by working with them on the Dawdon Minewater Treatment Scheme.

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Treatment building under construction

Photo courtesy of the Coal Authority

The process of obtaining planning approval for the scheme was long and complex due to the sensitivity of the local populace to its former mining legacy and the environmental damage of the past. Extensive public liaison and meetings resulted in a scheme that is fully integrated with Heritage Coast works and a SSSI.

### Partnering

The project involved all four of the Coal Authority's ENVision partners, along with other specialist inputs, including:

- Mott MacDonald Ltd - Civil, Structural and Building Services design.
- Siltbuster Ltd (formally Unipure Europe Limited) - Process design.
- JN Bentley - Principal Contractor for the pipeline contract.
- Interserve Project Services Ltd - Principal Contractor for the treatment works contract.
- Atkins - NEC ECC Project Manager.
- White Young Green - Hydrogeology and Planning Liaison.

The Coal Authority have actively promoted partnering and value engineering at all stages of the project. Early Contractor Involvement was used to advise the design and the Coal Authority's Operations team were closely involved in developing the functional layout of the plant.

An example of a successful innovation was the use of an extranet system which allowed all parties access to scheme documents, including those on site. Procedures within the system to control ECC contractual processes were also utilised.

### Process Design

A bespoke high density sludge process has been developed to reduce the iron content in the minewater from 160 mg/l to 1 mg/l. Three

process streams have been installed to treat up to 150 l/s, with the option to increase this to 200 l/s if required in the future. The facility includes:

- De-gassing tanks with associated blowers to strip dissolved carbon dioxide from the minewater;
- Stage 1 reactors where recycled sludge is mixed into the influent;
- Stage 2 reactors where lime is dosed to raise the pH levels and the minewater is further aerated;
- In-line polymer dosing to promote flocculation;
- Lamella plate clarifiers/thickeners;
- Sludge holding tanks;
- Filter press for sludge dewatering.
- PLC control to run the plant automatically based on inter-process and final effluent water quality measurement.

As part of the design development a pilot plant study at the nearby Horden minewater treatment facility was undertaken to optimise the process. This resulted in a number of innovations to reduce reagent use and minimise sludge generation.

### Sustainability and Environmental issues

Sustainability and environmental protection has been an integral part of the design and construction processes. Examples include:

- Coastal modelling to refine the design of the outfall to reduce the impact of hyper saline waters at the discharge point.
- Use of a specialist sub-contractor with the ability to 'push' the sea outfalls through a directional drill from the cliff. This minimised disturbance to the foreshore.
- Recycling drill arisings from the directional drills by drying and using as bedding for ducts.

- Reusing all excavated material within the site.
- Recycling more than 135 tonnes of waste timber, packaging etc from the building contract, some 89% of that generated.

**Health and Safety**

Health and Safety have been a priority throughout the design and

construction process. JN Bentley developed a 10 Golden Rules and mandatory glove policy initiative on this project and have since rolled this out to all their sites. Interserve have operated a 'don't walk by' campaign and actively consulted the whole site team in relation to safety. These initiatives have contributed to zero reportable accidents with over 120,000 hours worked.

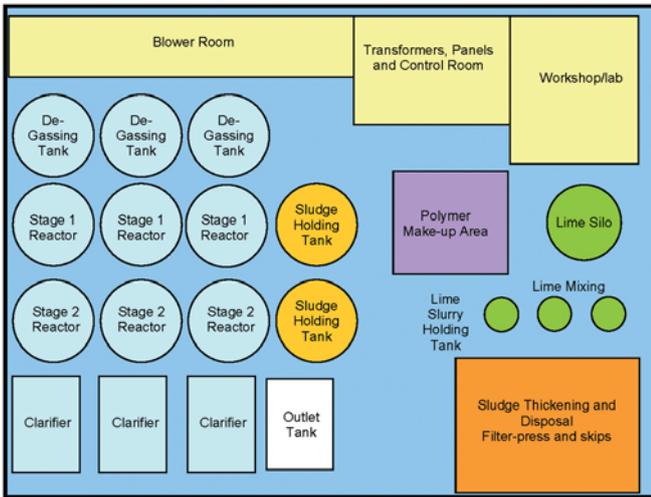
**Budget and Programme**

The works were completed within the allocated £6.7m budget. The construction works commenced in July 2007 and were completed within programme. The final commissioning and process optimisation phase of this unique process was completed in May 2009.

**Conclusion**

The scheme has been an excellent demonstration of the benefits of partnering, with all of the Coal Authority's engineering and environmental partners involved. The project was commended at the 2009 ICE North East Robert Stephenson Awards, with 'exemplary teamwork' cited by the judges.

*Note: The editor & Publishers thank Peter Charlesworth, Framework Manager for Mott MacDonald Ltd, and Stuart Rolley, Head of Minewater Development for The Coal Authority, for providing the above article. ■*



Schematic Layout of Treatment Plant



Clarifiers and final effluent chamber

Photo courtesy of the Coal Authority