

# The Edie 2009 Awards for Environmental Excellence Water

**Dawdon Minewater Treatment Scheme**

**Aquifer Protection in County Durham**

**Bentley** 



**m** Mott  
MacDonald

THE  
COAL  
AUTHORITY

**ATKINS**



 Interserve

Dawdon Minewater Treatment Scheme  
Aquifer protection in County Durham



## Introduction.

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We consider the Dawdon scheme to be an extremely strong candidate for this award given the unique multi-disciplinary nature of the project, the engineering challenges overcome and the environmental and community benefit that has accrued.



View of the former Dawdon Colliery

The project has prevented irreversible pollution of the East Durham aquifer and adjacent coast by iron and chloride rich minewater. The aquifer currently provides 36 million litres / day of drinking water to Sunderland and the surrounding communities.

The scheme also complements the Turning the Tide project, carried out by the Durham Heritage Coast, which has remediated the legacy of pollution caused by historic mining and created an attractive coastal environment.

The scheme has been an excellent demonstration of the benefits of partnering, with all of The Coal Authority's engineering and environmental partners involved.

Construction commenced in July 2007, with final completion in June 2009.

## Project Team.

### Client

The Coal Authority

### NEC ECC Project Manager

Atkins Ltd

### Principal Contractors

Contract 1 — Flow Transfer  
J N Bentley Ltd

Contract 2 — Treatment Works  
Interserve Project Services Limited

### Designers

Civil, Structural and Building Service Design  
Mott MacDonald Limited

Process Design  
Siltbuster Ltd (Formerly Unipure Europe Limited)

### Hydrogeology and Planning Liaison

White Young Green

## Background.

### 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. Additionally there would also have been the threat of minewater emissions onto the East Durham coastline and the River Wear.

The long-term solution involves treating minewater pumped 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 highly saline nature of the minewater 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 and rising mains (800m).
- Twin directionally drilled short sea outfalls.
- Treatment building, housing the active treatment process and support accommodation.

## Background Continued.

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.

### Process Design (See page 5 for Process Layout Diagram)

In summary the high density sludge process has been developed to remove iron oxide (160mg/l to <1mg/l) from the minewater and includes:

De-gassing stage to strip carbon dioxide, this was added to minimise chemical usage.

Stage 1 reactor – recycled sludge added to process.

Stage 2 reactor – pH adjustment using lime to raise the pH levels .

Clarification (lamella plate), polymer added in-line to form flocculates.

Sludge formed is then recycled into the first stage with excess sludge transferred to holding tanks prior to dewatering in a filter press. As part of the design development a pilot plant study was undertaken to optimise the process. This resulted in a number of innovations to reduce reagent use, reduce sludge generation and reduce Health and Safety issues with chemical delivery.



View of treatment system

## Background Continued.

### 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 waste mud from the directional drills by drying it and using as duct bedding.
- Incorporating 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.

### Partnering

The Coal Authority have actively promoted partnering at all stages of the project. Framework consultant and contractor partners have been involved from the beginning of the project. One successful innovation was the use of an extranet system which allowed all parties (including those on site) access to the latest scheme documentation and drawings.

Procedures within the extranet system to control ECC contractual processes were also utilised.

The Client's operations team were heavily involved in the functional layout of the plant, material selection and in commissioning.

## Background Continued.

A value engineering process was undertaken. This realised some significant savings, for example removal of a fourth process stream whilst retaining the infrastructure to enable retrofitting. The process tanks were placed in a lowered area within the floor slab; thus enabling the height of the building to be reduced.



Dawdon Building during Construction

### Health and Safety

Health and Safety have been a priority throughout the design and construction process. JN Bentley developed a 10 Golden Rules initiative on this project and have since rolled this out to all of their projects. 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 115,000 hours worked.

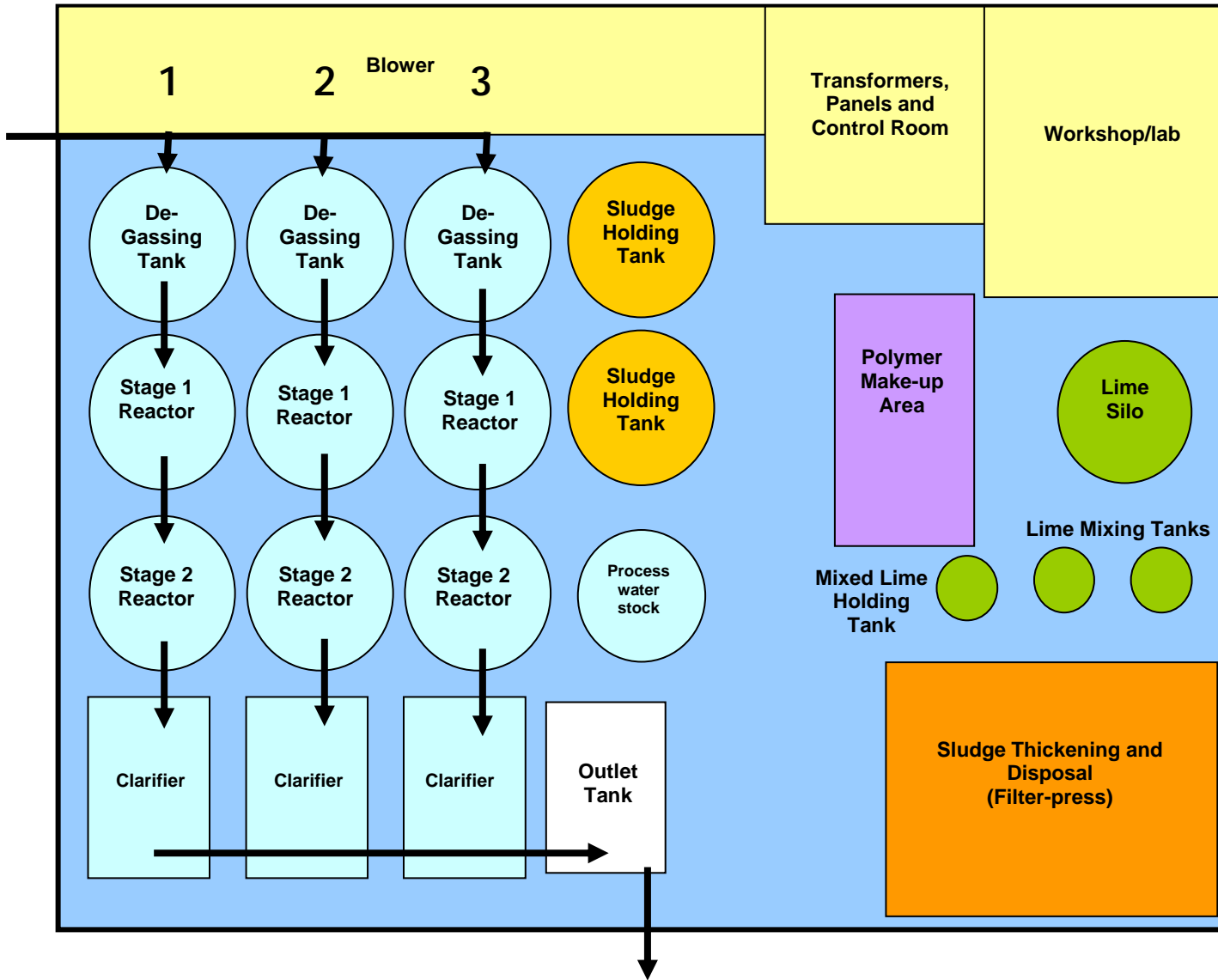
### Budget and Programme

The works were completed within the allocated £6.7m budget. The construction works were completed within programme, however the commissioning and optimisation phase of this unique process have necessitated an extended period of development.

### Community Benefit

The scheme protects the drinking water supply to an extensive local conurbation. It does so without prejudicing the status of the neighbouring Heritage Coast and has minimal visual impact.

# Process Layout Diagram



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