

Wheal Jane Minewater Project Pilot Passive Treatment Plant – Decommissioning Project

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Job title: **Project Manager**
Date: **May 2010**

Background

Wheal Jane Minewater Project
Pilot Passive Treatment Plant
– Decommissioning Project

- Mining has taken place in the Carnon Valley area of Cornwall for thousands of years.
- The Wheal Jane Mine was opened in Oct 1971.
- In the 1980's 900 tonnes of ore containing tin, zinc & copper was mined and processed at the Wheal Jane mine site on a daily basis.
- In 1985 tin prices fell from £10,500 to £3,300.
- In 1991 mining was officially terminated at the Wheal Jane site and a temporary water treatment system was installed.
- On 13th January 1992 50,000m³ of mine water left the Nangiles Adit....

Wheal Jane Mine water Treatment Project –



The project was initiated following the abandonment of the Wheal Jane Mine and the subsequent 1992 pollution event, to treat the metalliferous acid mine water which was continuing to discharge from the mine workings.

- ▣ A long term treatment strategy with two main options was assessed;
- 1. An Active Treatment Plant based upon lime dosing and settlement/storage within the Clemow's Valley Tailings Dam.
- 2. A Pilot Passive Treatment Plant located in the Carnon Valley.

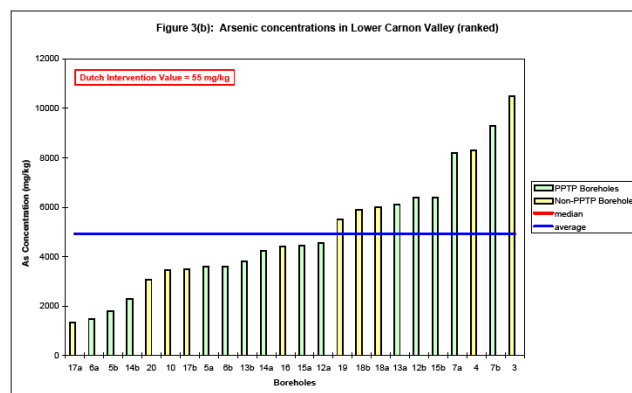
Carnon Valley - 1993



➤ Land Ownership

- The National Rivers Authority acquired 44 hectares of land in the Carnon Valley between July 1993 & November 1994.
- The land was purchased for the construction of the Pilot Passive Treatment Plant.
- It was also purchased as a possible site for the long term treatment facility.
- The land has been subjected to extensive mining activity during the 19th and 20th century.

Carnon Valley Arsenic Levels



Wheal Jane Minewater Project – Pilot Passive Treatment Plant

Construction of the Lime Dosed & ALD Systems - 1993



Construction of the Lime Dosed & ALD Systems - 1994

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Construction of the Lime Free Systems - 1994

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Pilot Passive Treatment Plant - 1995



Pilot Passive Treatment Plant - Overview

The Pilot Plant consisted of three separate treatment systems, although all three of the systems had the same principal treatment processes;

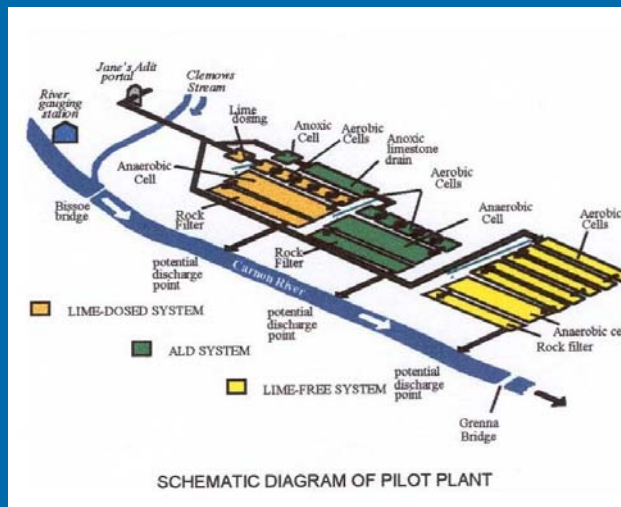
- Aerobic Cells – reed beds (iron removal)
- Anaerobic cell – (zinc, copper, cadmium & iron removal)
- Aerobic rock filter (manganese removal)

Pilot Passive Treatment Plant - Overview

The systems varied in the methods of pre treatment (or lack of) to raise pH prior to the minewater entering the Aerobic Cells:-

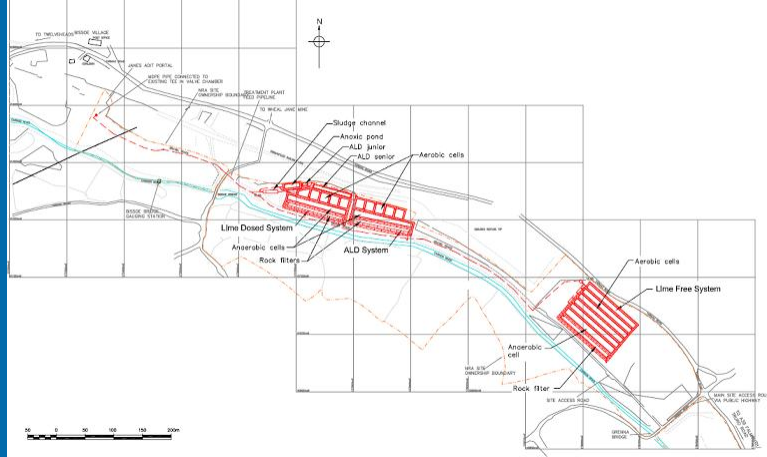
- Lime Dosed System:- Small lime dosing plant and precipitate trap.
- Anoxic Limestone Drain System – Small anoxic cell (Pre ALD) & Anoxic Limestone Drain (ALD)
- Lime Free System – No pre treatment.

Schematic Diagram of the Pilot Passive Treatment Plant



Pilot Passive Treatment Plant Layout

Wheal Jane Minewater Project
Pilot Passive Treatment Plant
– Decommissioning Project



Lime Dosed & Anoxic Limestone Drain Systems - 1994

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Anoxic Limestone Drain System - 1994

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Lime Free System - 1994






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Lime Free System - 1994



Pilot Passive Treatment Plant - Timeline

-  Constructed between 1993 & 1994 at a cost of over £1.2 million.
-  Operated from 1994 to 1998 as part of the Wheal Jane Minewater Treatment project.
-  Modified in 1996 to increase potential treatment regimes.
-  Operated as part of the Link project from 1998 – 2002, a jointly funded academic research programme.
-  2008 – The plant was no longer operational.

Lime Dosed & Anoxic Limestone Drain Systems - 2008



Control Building - 2008



Planning Permission

- ✚ The Wheal Jane Pilot Passive Treatment Plant and Gauging Stations were constructed under a conditional planning decision 93/1119 (CK3.5) issued on the 25th October 1993 by Cornwall County Council as the County Planning Authority.

- ✚ Condition 7 of the planning decision stated that;

7. At such time as the pilot works hereby approved are no longer in use all buildings, plant machinery and equipment shall be removed unless otherwise agreed by the County Planning Officer and the land treated in accordance with a scheme to be agreed by the County Planning Authority.

Pilot Passive Treatment Plant Decommissioning Project

Decommissioning Project

Major Project Objectives

- To discharge condition 7 of the 1993 planning decision to the satisfaction of Cornwall County Planning Authority by March 2009 for under £300,000.
- In discharging the planning condition ensure that potential pollution pathways from the treated material, storage and treatment mediums within the Pilot Passive Treatment Plant to groundwater, surface water and to the atmosphere were mitigated.
- Public Safety issues identified with the Pilot Passive Treatment Plant infrastructure were addressed by March 2009.

Decommissioning Project

Minor Project Objectives

- Biodiversity
- To mitigate loss of habitat by creating an area of approximately 7000m² of new wetlands by March 2009.
- To provide where feasible additional habitat creation and enhancements by March 2009.

Decommissioning Project

- Minor Project Objectives
- Recreation
- To construct an alternative 'dry' route for the Mineral Tramways Trail to a route and standard agreed with Cornwall County Council by March 2009.
- To improve and increase the car parking area at Grenna Lane by March 2009.
- To find alternative uses for the control building and Devoran gauging station by March 2009 to prevent the need for demolition.

Decommissioning Project Team

The project team consisted of national, regional and area Environment Agency staff lead by a Project Manager from the local area Operations Delivery Technical Support team.

- Principal Contractor – Environment Agency Operations Delivery
- Specialised Sub contractor – Carnon Contracting
- Disposal Site – Wheal Jane Ltd
- Consultants –
 - Royal Haskoning – Environmental Impact Assessment
 - Naturule – Ecological Assessment
 - Black & Veatch – CDM Co-ordinator
 - Halcrow – Landscape Architect

Clearance of reed bed substrate - 2009



Anoxic Limestone Drain System reed bed cells - 2009



Lime Free System reed bed cell liner - 2009



Clearance of the Lime Free System Anaerobic Cell - 2009



Clearance of the Lime Free System Anaerobic Cell - 2009



Clearance of the Anoxic Limestone Drain System anaerobic cell - 2009



Anoxic Limestone Drain exposed for removal - 2009

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Clemow's Valley Tailings Dam - 2008

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Snow & Floods - 2009

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➡ Health & Safety Near Misses

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➤ Environmental Near Misses

- Jan 09 – Damage to the outlet weir draining the reed beds into the rock filters on the Lime Free System
- Jan 09 – Silt discharge into the Lime Free System rock filters
- Feb 09 – Frog deaths during clearance of Lime Free System rock filters
- Mar 09 – Petrol can left by Lime Dosed System rock filters

➤ Environmental Near Misses – No harm done



Phase 2 – Habitat Creation & Recreational Enhancements

Concrete being stockpiled for crushing - 2009



Aggregate produced from crushed concrete - 2009



Patching of the anaerobic cell liner - 2009



**Infilling of the Anoxic Limestone Drain System
anaerobic cell - 2009**

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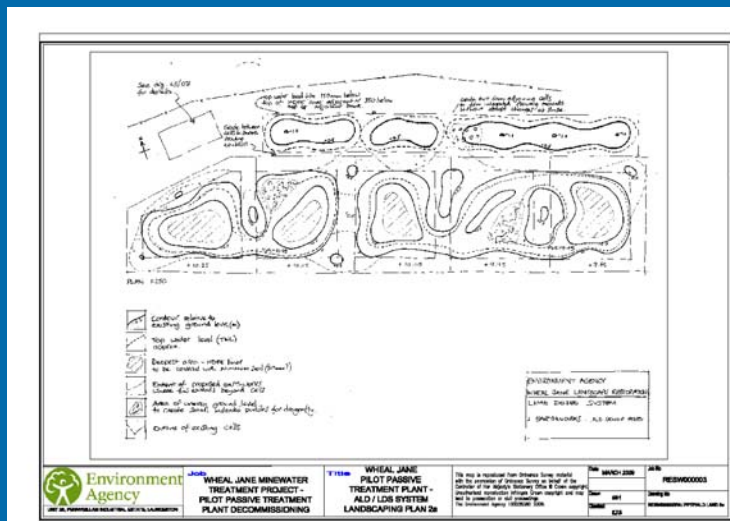
Infilling of the anaerobic cell liner - 2009

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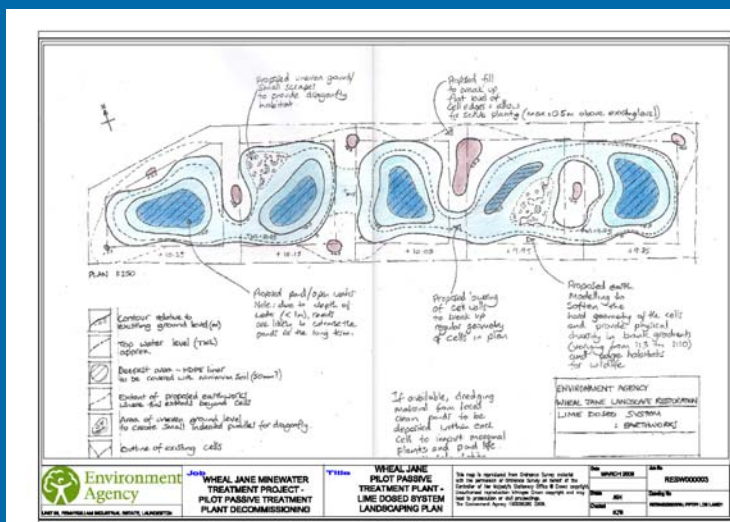
Habitat Creation

Wheat Jane Minewater Project
Pilot Passive Treatment Plant
- Decommissioning Project



Habitat Creation

Wheat Jane Minewater Project
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Creation of ponds adjacent to the utility trail - 2009

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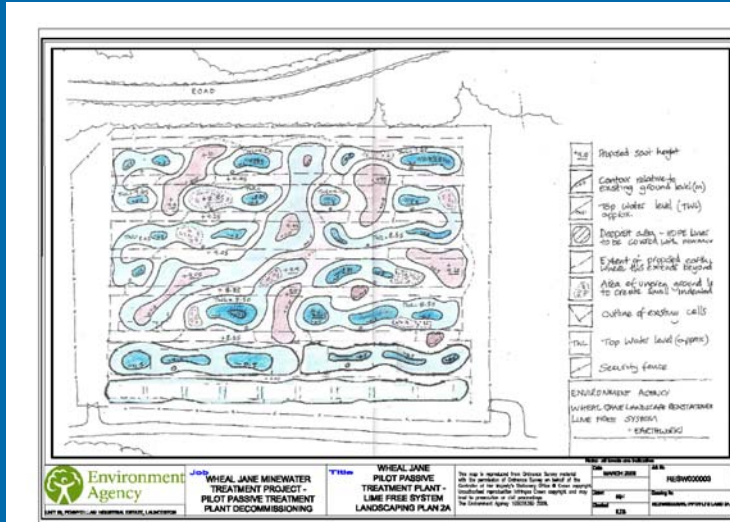
Creation of ponds in the Anoxic Limestone Drain – 2009

Wheal Jane Minewater Project
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Habitat Creation

Wheal Jane Minewater Project
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Start of pond creation in the nature reserve - 2009

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Creation of ponds in the nature reserve - 2009

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Construction of the utility trail - 2009

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Construction of the utility trail - 2009



Field Delivery operatives installing fencing - 2009



‘Cone’ Circle – Layout of the stone circle - 2009



‘Dans Maen’, (Cornish for Dancing Maidens) - 2009



Re-use and recycling – Carnon Valley

- 125m³ reinforced concrete was crushed on site to construct the recreational trail.
- 17,500m² of HDPE liner was re-used for creation of the habitat & recreational areas.
- 7000 tonnes of inert material was potentially diverted from landfill for use in the habitat creation.
- The re-use of granite boulders to create a traditional stone circle, or Dans Maen (Cornish for Dancing Maidens) as a centre piece to the site and a picnic area.
- Less than 16 tonnes of waste was eventually taken to landfill.

Decommissioning Project Methodology

Key project lessons learnt-

- Project Forums & public consultation
- Internal project team
- Design – reflecting the history of the site and the unique biodiversity
- Waste management plan – A key tool - attention to detail
- Partnership working - Contractor & Disposal site
- Project Management staff on site

➤ A picture is worth a thousand words!

Carnon Valley - 2005 to 2009



View of the Lime Dosed & Anoxic Limestone Drain Systems

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Environment Agency

View of the Lime Dosed System

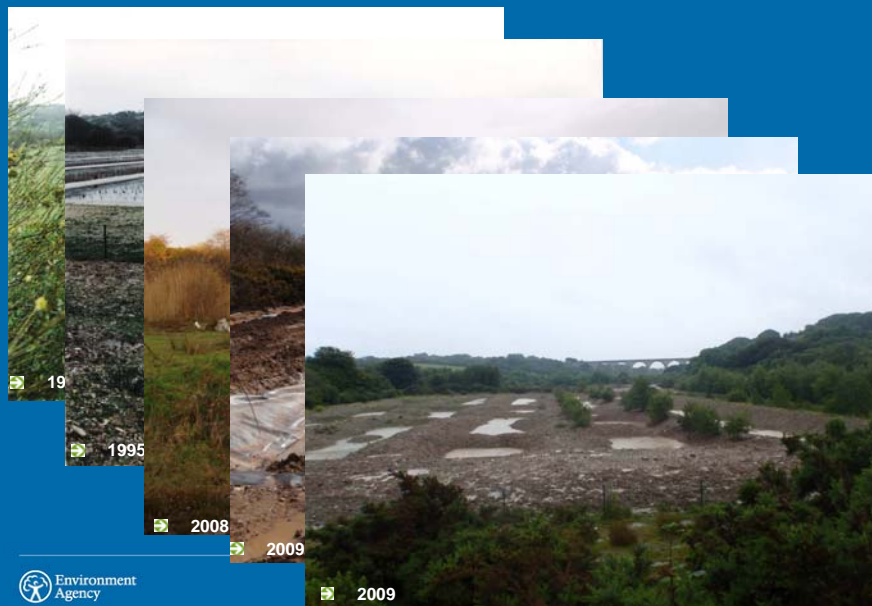
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Environment Agency

View of the Lime Free System

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Summary of Project Outcomes

Wheal Jane Minewater Project
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- ✦ The decommissioning was completed on time and to budget, including the disposal of 9000 tonnes of metalliferous material.
- ✦ By clearly defining the waste classification of the material arising from the decommissioning, disposal of the metalliferous material was possible at the Clemow's Valley Tailings Dam just over 3 km away from the site.
- ✦ This generated a reduction of 263,568 miles equivalent to 937 tonnes of CO² when compared to the original disposal site at Swindon 415 miles away.

Re-use and recycling – Clemow's Valley Tailings Dam

- 500 tonnes of excavated limestone was reused for internal roadways and drainage.
- 4400 tonnes of material has been set aside for engineering purposes.
- 800m of pipe has been reused to overcome surface water drainage issues within the paddocks on the dam, avoiding the need for over pumping.

Re-use and recycling – Carnon Valley

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Summary of Project Outcomes

- The creation of 11,600 m² of improved wetland habitat.
- The creation of a nature reserve using locally sourced material, creating habitat for species including the endangered Scarce Blue-tailed Damselfly.
- The creation of an additional 'dry' utility trail to supplement the Mineral Tramway Cycle Path, providing access to the site for disabled users, cyclists, walkers and horse riders .

Summary of Project Outcomes

- Increase in the capacity of the Grenna Lane Car park, providing additional capacity for recreational users to visit the site.
- Provide a resource for local community/enterprise in the Control Building & Devoran Gauging Station.
- Contributing to the local economy by providing a substantial project, delivered by a local SME in Cornwall.

Summary of project recognition

- ✚ Winner of a Golden International Green Apple award for Environmental Best Practise
- ✚ Runner up in the Chartered Institute of Waste Management Awards for Site Management – Construction & Demolition
- ✚ Runner up in the Environment Agency sustainable procurement awards
- ✚ Winner in the Environment Agency Operations Delivery Managers Award – Environment
- ✚ Recognition of the local community who are using and enjoying the site



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