

Dŵr Cymru

**Afan Wastewater
Treatment Works**

Site Condition Report

ISSUE

Dŵr Cymru

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Treatment Works**

Site Condition Report

October 2009

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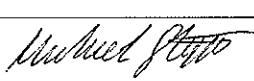
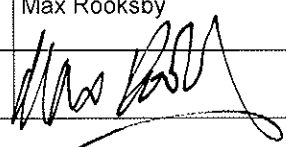
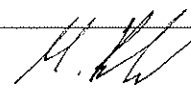
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Contents

	Page
1 Site Details	1
1.1 Applicant	1
1.2 Activity Address	1
1.3 National Grid Reference	1
1.4 Document reference and dates for SCR at Permit application	1
1.5 Document references for site plans	1
2 Condition of the Land at Permit Issue	2
2.1 Environmental Setting	2
2.2 Pollution History	3
2.3 Evidence of Historical Contamination	6
2.4 Baseline Soil and Groundwater Reference data	6
2.5 Additional supporting Information	6
3 Permitted Activities	7
3.1 Permitted Activities	7
3.2 Non-permitted Activities Undertaken	7
3.3 Dangerous Substances	7
3.4 Document References	7

Appendices

Appendix A

Site Location Plan

Appendix B

Site Reconnaissance

Appendix C

Raw Materials

Appendix D

Other Information

1 Site Details

1.1 Applicant

Dŵr Cymru (Welsh Water) is the applicant for an Environmental Permit for the operation of the Afan Waste water Treatment Works (WwTW) Combined Heat and Power (CHP) Facility.

1.2 Activity Address

The installation is located at the following address:

Afan Waste Water Treatment Works
Harbour Road
Phoenix Walk
Port Talbot Steelworks
Port Talbot
SA13 1RA

1.3 National Grid Reference

The centre of the site is located at National Grid Reference 276032, 187458. The whole site covers an area of 3 Ha. The location of the site is shown in **Appendix A**.

1.4 Document reference and dates for SCR at Permit application

The Site Condition Report (SCR) is accompanied by Application Forms A, B and F, the Afan WwTW Advanced Digestion Project Supporting Information, EP OPRA and H1 for the Application for an Environmental Permit.

This document is Version 1 of the Afan CHP SCR, (15/10/2009). It has been produced to support the application for an EPR Permit for the operation of the installation.

1.5 Document references for site plans

Site details are covered under Appendix A, including the following maps:

- Site Location Plan;
- Area covered by SCR;
- Afan Wastewater Treatment Facility Site Plan;
- Location of receptors;
- Sources of Emission;
- Site drainage;
- Site surfacing; and
- Site Reconnaissance.

2 Condition of the Land at Permit Issue

2.1 Environmental Setting

2.1.1 Geology

All geological maps for the site were obtained from the Landmark Information Group for the area within 1000 m of the installation and are located in **Appendix D**.

The geological sequence beneath the site is as follows:

- Made Ground
- Blown Sand
- Estuarine Alluvium
- Fluvio-glacial Deposits
- Middle Coal Measures

Made Ground

Made ground of sand and gravels of man made origin, made up of clinker, limestone, sandstone and concrete - Total thickness of between 1.3m and 4.5m.

Blown Sand

The published geological map shows the site to be directly underlain by blown sand. The borehole information for an area just south-west of the site shows the sand to be 10 -15m thick, beneath 1.5m to 3m of made ground containing slag fragments.

Estuarine Alluvium

The sand is underlain at depths of about 10m by an alluvial sequence of interbedded sand, sandy silt and organic silty clay, including a thin layer of peat. The published map confirms the alluvium to be present within the former tidal mouth of the River Afan.

Fluvio-glacial Deposits

Very dense slightly clayey or silty sandy subangular to rounded fine to coarse gravel of sandstone and siltstone, with medium to high cobble content and pockets of firm and stiff clay. Cobbles are subangular to subrounded sandstone and mudstone.

Middle Coal Measures

The solid geology comprises Middle Coal Measures strata, consisting of sandstones, shales and siltstones. The strata dip approximately 14-15° in a northerly direction.

The conjectural outcrop of the 2' 9" coal seam lies approximately 200 metres north of the site. According to the generalised vertical section, the 6-feet coal seam could lay some 80 metres beneath the study area.

The strata beneath the site form part of a synclinal structure and are also displaced by associated major and minor faults. The conjectural position of one such fault, the "Giant's Grave Fault", is shown some 400 metres east of the site. No faults are shown affecting the site itself.

2.1.2 Hydrogeology

Prior to land reclamation, the area was located at the mouth of the River Afan. The river was diverted northwards in the nineteenth century to facilitate dock construction. The site then lay within the former course of the river, known as "Old River", and for a period was subject to encroachment by beach and dunes from the north-west, becoming part of the Margam Sands at the edge of the Bristol Channel. The old river mouth was infilled in the mid twentieth century by tipping of steelworks waste on Morfa Bank. This process eventually extended to the site itself which was accordingly raised and reclaimed from the estuary.

Environment Agency records suggest that the study area is underlain by a minor aquifer of variable permeability. The soil at the site is unclassified, which is common for industrial areas.

The made ground, blown sand and granular glacial deposits beneath the site are likely to have a medium permeability, whilst the intervening alluvium, is likely to have low permeability.

Drilling works adjacent to the study site provided some information on water strikes; the water table is expected to lie some 4m or 5m below the surface level. Groundwater levels at the site may be influenced by tidal variations.

2.1.3 Surface Water Features

Hydrological data was obtained from Landmark Information Group, which indicate that there are no watercourses within 1000m of the installation. The site is however within 100m of Mean High Water of the Bristol Channel.

A Flood map is included as **Appendix D**.

The current Environment Agency (EA) flood map shows the site lying mainly within a Zone 2 area, the furthest western part of the site lying within a Zone 3 area. The flood plain zones are described as follows:

Zone 2 - Extreme flooding from rivers or sea without defences: the additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1% (1 in 1000) chance of occurrence each year. The likelihood of flooding in this zone is therefore considered to be low.

Zone 3 - Flooding from rivers or sea without defences: the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences or certain other manmade structures and channel improvements. This zone is indicated as having a significant chance of flooding, greater than 1.3% (1 in 75) each year.

On the TAN15 Development and Flood Risk advice map SS78NE, the northern part of the site is classified Zone C2, meaning that it is without significant flood defence infrastructure, whilst the south of the site is within an area known to have been flooded in the past.

The surface water features in the vicinity of the site are shown on **Appendix A7**.

Site drainage for the site is shown on **Appendix A5**.

2.2 Pollution History

2.2.1 Pollution incidents

The Landmark Information Group was commissioned to provide records of any land pollution incidents associated with the site and within 1000 m of the site boundary. All pollution incidents are included in the Envirocheck Report within **Appendix D**.

2.2.2 Historical land uses

Historical maps from 1885 to 2008 at 1:2500; 1:10 000 and; 1:10 560 have been reviewed to assess land-use change and to identify land uses with potential for contamination. Descriptions of historical land use have been conducted for both the installation area and the current WwTW. Copies of historic maps reviewed are included in **Appendix D**.

1885, 1:10 560

The site was located at the former mouth of the River Afan (shown as 'Old River'). The site area comprised beach (part of Margam Sands), with the high water mark of ordinary tides at about 100m north of the site. Extensive areas of sand dune are indicated along the coast either side of the river mouth.

1900 1:10 560

The Port Talbot railway Docks Branch extended beyond the tidal coast zone (Morfa Newydd) which was being raised and reclaimed by tipping. The course of the Old River had altered the channel passing close to the south-east corner of the site.

1921 1:10 560

The tipping and reclamation of the area was extended further south. The course of the Old River channel had altered again, passing 140m east of the site, the 1900 course having become infilled.

1951 1:10560

No further reclamation of Morfa Newydd had taken place. High water mark of ordinary tide had moved southwards, passing through the centre of the site. Margam Iron and Steel Works had been constructed some 1.5km north-east of site, with extensive reclamation from tipping of steelworks wastes.

1965 1:10560

Margam Steel Works had expanded and part of the inter-tidal area south of the site had been largely reclaimed by tipping of steelworks wastes, to form an area known as Morfa Bank. Most of the "old river" mouth has been now reclaimed. High water mark of medium tides is about 50m south-west of the site. A pipeline is indicated as crossing the site and discharging to the Bristol Channel.

1980 1:10 000

The steelworks had been further expanded and the Morfa Newydd area developed with travelling cranes and conveyors. The Morfa Bank tipping/reclamation had been extended to cover the southern two thirds of the site. Part of the former river course, located NE to the site, had been developed as a sludge pond. Port Talbot Deep Water Harbour has been completed to the west of the site.

1993 1:10 000

The sewage pumping station had been constructed west of the site.

1999 1:10 000

No new major land use changes recorded in the vicinity of the site

2008 1:10 000

Records the Waste Water Treatment Works in its current layout

2.2.3 Visual and olfactory evidence of contamination

A site reconnaissance was undertaken by Arup on Monday 5th October 2009 on the area shown in **Appendix B1**. The purpose of the reconnaissance was to inspect the site and surrounding area for indicators of potential land pollution. Site infrastructure was visually inspected to assess its competence and potential to cause or have caused releases to land air or water.

During the site reconnaissance visit, no evidence of critical visual or olfactory contamination was found at the site. The existing cake silo produced sludge cake located over hard-standing (Photograph 9, Appendix B2) from a leaky valve; however there was clear evidence of cake being cleared at regular intervals and the drainage returns back to the WwTW for treatment.

All areas of hardstanding appeared intact for current and future development.

All vegetation on site has been removed; seeded top soil will be transferred to an area of proposed scrub habitat to the south of the site. The top soil from the site as a result of the development works did not appear to be contaminated and its appearance was as would be expected.

Associated photographs of the Afan site have been included in **Appendix B2**.

2.2.4 Evidence of damage to pollution prevention measures

There was no evidence of damage to the existing structures on site that will form part of the CHP Facility.

All new elements of the installation including the CHP are new items and as such are not damaged. Commissioning of the plant following construction ensures that the plant is fully operational and not damaged.

2.2.5 Associated Contaminants

Early 20th C sludge was spread on land and allowed to dry out before being ploughed into the soil. The liquid was distributed by field irrigation.

The chemical composition of incoming industrial effluents varies widely in terms of heavy metal and organic chemical compounds and could include solvents and pesticides.

Some chemicals include aluminium, iron and chlorine compounds used in treatment. Polyelectrolytes may be used in the flocculation stage. Sodium hydroxide or hydrochloric acid may be added to adjust the pH of effluent to assist biological breakdown.

When higher flows occur during rainfall, part of the sewage may be diverted and held in storm-water tanks. This is treated once the high flow has subsided, or if the flow is very high, the sewage may be discharged, untreated, into Swansea Bay.

There is the potential for the following contamination to be present at sewage Treatment Works:-

- Metals, organic pollutants and micro-organisms (potentially pathogens) in sludge drying beds and storage areas;
- Leakages from pipe works and tanks leading to localised higher concentrations of contaminants and from use of land storage;
- Potential generation of methane, carbon dioxide and hydrogen sulphide and dried sludge can be combustible;
- Some pipe work and building materials such as cladding and roofing may contain asbestos;
- Inorganic compounds such as nitrates and sulphates.

A large proportion of residual contaminants in sludge's may have a low solubility and be absorbed into fine particles. The movement of soil particles through soil is retarded by the presence of clay minerals and organic matter. Leaching might be concentrated in the shallow soil.

The presence of organic compounds such as solvents and pesticides will be influenced by the industries serviced by the works.

2.2.6 Wastewater Treatment Works Contamination

2.2.6.1 Sewage Treatment Works

Sewage sludge potentially contain elevated levels of nitrogen (predominantly in the form of ammonium and organic-N), metals and metalloids (including Hg, Cu, Ni, Pb, Zn, As, Cd, Se, Mo, Co, Cr and Ag), phosphate, microorganisms (potentially pathogens), and organic compounds (including PCBs, PAHs, organochlorine pesticides, phthalate esters, surfactants, furans, chlorobenzenes, solvents, phenols and dioxins).

Additionally, a wide variety of materials may be screened from raw sewage. These materials may include textiles, plastics, metals, wood or other plant fragments.

2.2.6.2 Leaking or Overflowing Tanks

It is potentially possible that some of the tanks present on the site have leaked in the past and, it is possible that, especially at times of heavy rainfall, the tanks may have overflowed onto the surrounding land.

2.2.6.3 Burial

Waste material, such as sludge or screenings, may have been historically buried on or near the site. Burial of material is likely to have taken place in discrete 'hotspots'. It is unlikely that any burial areas were lined or capped. The nature of the material buried will determine whether it would biodegrade readily, the volumes and concentrations of leachate generated, and the potential for gas generation and accumulation.

2.2.6.4 Chemical Storage & Use

Historically, any chemicals or fuels stored or used may potentially have leaked or been spilled. Such chemicals might include aluminium sulphate, ferric chloride or sulphate, lime, poly electrolyte's (generally biodegradable), fuel oils or lubricating oils, insecticides and herbicides.

Herbicides and pesticides may have been used widely to control vermin and weed growth across the site.

2.3 Evidence of Historical Contamination

During the site reconnaissance survey no evidence of historical contamination of the site was evident. Data obtained from pollution investigations undertaken at or near the site are summarised in **Appendix D**.

2.4 Baseline Soil and Groundwater Reference data

All associated Figures demonstrating the baseline soil and groundwater conditions beneath the proposed facility are located in **Appendix D**.

The soil has been categorized as unclassified by Landmark data.

2.5 Additional supporting Information

2.5.1 Environmental Consents, Licenses, Authorisations, Permits and Designations for the Site and Surrounding Area

Landmark Information Group was requested to provide records of any Discharge Consents, Waste Management Licenses, Abstraction Licenses, IPC Authorisations, PPC Permits and Land Drainage Consents for the site and within 1000 metres of the site boundary. The data is provided in **Appendix D**.

3 Permitted Activities

3.1 Permitted Activities

Permitted activities include:

- Combustion of biogas in the CHP facility, including two CHP units and in two dual fuel hot water boilers.
- Generation of approximately 1560kW of electrical power by each the CHP unit.

3.2 Non-permitted Activities Undertaken

Non-permitted activities undertaken are as follows:

- Imported sludge is transferred from a tanker into a steel storage tank. The screen sludge discharges into the raw sludge transfer pump station and then to the raw sludge storage tank.
- The sludge is conditioned using pressurized steam in the Thermal Hydrolysis Plant (THP).
- Transfer of heat from the installation to the EEH process and the sewage sludge digesters.
- Duty/ stand-by dosing pumps the polymer into the sludge stream feeding the sludge thickeners.
- Thickened sludge is pumped to the thickened sludge tank and then pumped to the digesters.
- Each digester discharges to secondary digesters, which then gravitates to digested sludge holding tanks.
- The sludge is pumped with two positive displacement pumps to two centrifuges for dewatering.
- Polymer for sludge dewatering is dosed from a second batch make up system.
- The dewatered sludge is conveyed to cake pumps with a screw conveyor, and the cake is pumped to a cake storage and collection area.
- The cake is pumped to a 600 m³ cake silo that is fitted for discharge to truck and removal offsite.

3.3 Dangerous Substances

Appendix C identifies the raw materials used as part of the Afan CHP Facility, none of the raw materials used on site have been deemed to be dangerous.

The Afan CHP is not subject to Control of Major Accidents Hazards Regulations (1999) (COMAH).

3.4 Document References

All site location plans are included in **Appendix A**.

The environmental risk assessment for the above mentioned permitted activities is included as part of the H1 assessment for the Afan Permit.

Appendix A

Site Location Plan

A1 Site Location

A2 The Area Covered by the Site Condition Report

A3 Installation Boundary

A4 Location of Receptors

A5 Site Drainage

A6 Site Surfacing

A7 Surface Water Features

Appendix B

Site Reconnaissance

B1 Site Reconnaissance Map

B2 Site Reconnaissance Photographs



Photograph 1: Site office (Bottom left), granule silo (central), and drier building converted for CHP units and boilers (Middle left)



Photograph 2: Sludge digester (in development) looking south



Photograph 3: Concrete slab in preparation for proposed hydrolysis plant and digested sludge storage tank, looking east



Photograph 4: Proposed access road looking north east



Photograph 5: Concrete slab in preparation for proposed hydrolysis plant and digested sludge storage tank, looking North West



Photograph 6: Concrete slab in preparation for proposed sludge de-watering and storage building, looking north



Photograph 7: Top soil for proposed scrub habitat, looking south



Photograph 8: New access road and relocated liquor balancing tank, looking south west



Photograph 9: Waste from leaking cake silo



Photograph 10: Leaking valve from existing cake silo



Photograph 11: Existing sludge de-watering building

Appendix C

Raw Materials

C1 The types and amounts of raw materials (Schedule 1 activity's only)

Schedule 1 Activity	Use	Raw material and chemical composition	Storage location and capacity	Quantities used	Fate of the material in the installation (ie. approximate percentages to each environmental medium and to the products	Environmental impact (eg. degradability, bioaccumulation potential, toxicity to relevant species);	Reasonably practicable alternative raw materials	Justification for the continued use of any substance for which there is a less hazardous alternative
Combustion	Combustion fuel 1	Bio gas CH ₄ /CO ₂ /N ₂ /trace substances	Gas holders 1 x 2000 m ³ at standard operating pressure	6,920,765 m ³ /annum	100% combustion products to air	Combustion product CO ₂ is a greenhouse gas	None. The biogas is from a waste	Renewable energy under the OFGEM ROCs system.
	Combustion fuel 2	Natural gas	National grid	735,955 m ³ /annum	100% combustion products to air	Combustion product CO ₂ is a greenhouse gas	Used as top up energy for production of biogas	Substantial reduction of natural gas compared to the composite boilers. Increased biogas production contributing to greener renewable energy.
	Boiler feedwater for steam generation for heating WwTW process	Potable Water	N/A	<140,000 m ³ /d	90% into the sludge, 10% blown down and to the WwTWs via the site drainage	N/A	N/A	N/A

	In boiler water feed	Caustic soda (sodium hydroxide)	Within the plant room – 500l storage tank	<4,950l/annum	100% to boiler feed water, some sodium salts discharged with boiler blowdown	Negligible, no residual expected	N/A	N/A
	In boiler water feed	Anti foaming agent (polyphosphates)	Within the plant room – 500l storage tank	<4,950l/annum	100% to boiler feed water, ultimately discharged with blowdown water to the WwTW	Negligible, no residual expected	N/A	N/A
	Oxygen scavenger in boiler water feed	Sodium bisulphite	Within the plant room – 500l storage tank	<4,950l/annum	100% to boiler feed water	Negligible, no residual expected	N/A	N/A
	Hot water pipework	Corrosion inhibitor	Within the plant room – 500l storage tank	<2,000l/annum	100% to boiler feed water	Negligible, no residual expected	N/A	N/A
	Water softener (ion exchange process)	Salt (Brine solution)	Within the plant room – 500l storage tank (Bags of salt stored in pant room area)	<150l/annum	100% used for softener regeneration. Discharged with waste to site drains	Negligible, no residual expected	N/A	N/A
	Engine lubrication	Lubricating Oil	2000l inside the CHP container	12,045 l/annum	Recovered, re-used or disposed	Negligible	N/A	N/A

Appendix D

Other Information

D1 Envirocheck Report

D1.1 Datasheet

D1.2 Index

D1.3 Context

D1.4 Historical Mapping

D1.5 Mining and Ground Stability

D1.6 Site Sensitivity
