ANNUAL ENVIRONMENTAL REPORT

Period covered:	**January - December 2008**
Licence Register Number:	**P0482-02**
Licensee:	**Edenderry Power Ltd**
Location of Activity:	**Ballykilleen, Edenderry, County Offaly**
Attention:	**Office of Environmental Enforcement, Environmental Protection Agency, Regional Inspectorate, Seville Lodge, Callan Road, Kilkenny.**
Prepared by:	**Shane Molloy, EHS Coordinator, Edenderry Power Ltd.**

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Date: ____________________

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1.0 INTRODUCTION

The following is the Annual Environmental Report, covering the period January to December 2008, of operations at Edenderry Power Ltd's, 120 MW peat and biomass co - fired Power Station at Ballykilleen, Edenderry Co. Offaly, IPPC Licence Register No. P0482-02.

The plant is operated and maintained on behalf of Edenderry Power Limited by Edenderry Power Operations Limited and employs 45 people. It operates a bubbling fluidised bed boiler, burning milled peat and biomass and a steam turbine with a net electrical output of 117.5MW. The electricity generated is sold directly to the National Electricity Distribution Company, Eirgrid.

1.1 PROCESS DESCRIPTION

Peat & Biomass Handling System

Peat supplied by Bord na Mona Energy Ltd., is transferred primarily by rail to the unloading station. A small quantity of peat is delivered to the station by road. The biomass is also supplied by Bord na Mona, who source the material from various suppliers around the country. This biomass is delivered exclusively to the station by road. The peat and biomass unloading station and screening house with all necessary equipment is operated by Bord na Mona Energy Ltd, and the facility lies geographically outside the Edenderry Power Ltd site and outside the scope of the IPPC Licence and this Annual Environmental Report.

Peat and biomass are transferred from the Bord na Mona screening house to the intermediate peat storage building by belt conveyor, which crosses the site boundary between Edenderry Power Ltd's site and that of Bord na Mona Energy Ltd.

The intermediate storage facility is a longitudinal building of preliminary dimensions 80m by 25m, covered with a light roof and constructed of partly concrete walls. The storage capacity is approximately 6,000 weighed tonnes of material, depending on moisture content and bulk density.

The screw re-claimers feed two reclaim conveyors of 450m³/hr capacity which convey the peat and biomass to an inclined belt conveyor that feeds the plant day silos, which are located on top of the turbine hall roof. The first silo is fed via a hopper and the second via a belt feeder from the belt conveyor.

Control of the conveyors and screw re-claimers is integrated into the plant's Main Control System (DCS) and is controlled from the central control room. Emergency stop buttons are located beside the peat conveyors.

The system is designed for a maximum throughput of 900m³/hr. The anticipated annual throughput is 1.0 to 1.2 million tonnes per annum.

Emissions

The potential for wind blown dust emissions to arise from the fuel handling system exists. However, as the building and conveyors are covered this possibility is effectively eliminated.

Washing the components of the peat handling system occasionally generates small amounts of aqueous effluent, at approximately 1m³/hour. These wash waters, which may contain quantities of peat, are discharged to the settlement pond via the surface water drains where the peat settles out.

Fuel Oil Storage and Handling

Medium Fuel Oil (MFO) is used as start up fuel to supplement Gas Oil as required. The oil is stored in a 300m³ capacity storage tank, which is provided with a level indicator in order that the ullage can be checked prior to filling. The level indicator is connected to the plant's main Damatic Control System (DCS) so that the level can be monitored from the control room. An overfill alarm signal is also be relayed to the control room.

A bund designed to contain 110% of the tanks' capacity is provided to prevent any spillage being released into the surface drainage system. Rainwater collected in this bund is channelled via a stop valve and an oil/water interceptor, to the sites drainage system. The valve normally remains closed. Periodically, as rain water accumulates in the bund the contents of the bund are checked, and subject to their being no major oil spillage, the valve is opened and the rainwater drained to the settlement pond via the oil/water interceptor where minor oil spills are collected.

A bunded tanker unloading station is located beside the tank. A fuel unloading pump transfers the Medium Fuel Oil (MFO) from the delivery tanker to the storage tank. A flow meter measures the quantity of fuel delivered.

A system of underground distribution piping with a duplex strainer and 2x100% capacity transfer pumps is used to transfer the oil to the boiler. The distribution piping is fitted with trace heating and insulation is contained in a concrete trench which drains to a sump in the oil pump house. This sump is fitted with a liquid detector, which activates in control room on detecting accumulation of liquid in sump – allowing for detection of leaks in the underground pipes. The MFO oil is constantly re-circulated. The MFO pumping and preheating unit located inside the boiler house supplies MFO to the four burners located in the boiler package. This unit consists of two oil pumps with suction and pressure filters, one steam pre-heater and one electric pre-heater.

Gas Oil is also used for plant start up. Gas oil is stored in a 70m³ storage tank, which is also located within the Fuel Oil storage bund. Local and remote level indicators are also provided on the gas oil tank, which is filled by means of a pump on board the tanker. An overfill alarm signal is also be relayed to the control room.

Before connecting the tanker to the storage tank and filling the tank, the driver and plant operator check the level indicator to ensure that there is sufficient ullage to accommodate the delivery. Unloading of MFO is controlled by a local control system.

Control of the MFO pumps feeding the boiler is integrated into the plant's Main Control System and is controlled from the central control room. The Gas Oil pumps are also controlled via the Main Control System.

The quantity of MFO and Gas Oil used depends on the operating regime of the plant.

Emissions

In the event of a major oil spill, the spilled oil will be contained within the bunded area and will be tankered off site for disposal or recycling by an appropriately licensed contractor. Minor emissions of VOCs to air may arise during filling of the storage tanks.

Boiler and Ancillary Services

The boiler at Edenderry Power Ltd's site is a modern bubbling fluidised bed (BFB) unit manufactured by Kvaerner Pulping Oy. The boiler has a natural circulation water system and is designed to generate 100kg/s of steam, at 160 bar (g) and 540°C from feed-water pre-heated to 258°C. It also produces 88kg/s of reheated steam, at 39 bar (g) and 540°C. The main fuel used in the boiler is milled peat, though medium fuel oil may be used as auxiliary, as well as start-up fuel. Biomass may also be used to co-fire with peat, as well as category 3 MBM (up to a maximum of 10% of total fuel input). The designed fuel quantity to be burned is 1.0 to 1.2 million weighed tonnes per annum of Bord na Mona supplied peat which has an average net calorific value of 7.7 MJ/kg

The fluidised bed technology, as well as being highly efficient, is designed to ensure that emissions meet the Emission Limit Values detailed in the IPPC Licence. In order to meet SO_2 emission limits a dry limestone injection system is used. The limestone reacts with the SO_2 in the flue gas to form calcium sulphate (gypsum), which is removed from the flue gas stream along with the fly ash by the Electrostatic Precipitator (ESP).

Fluidisation is the specific condition in which solid particles are suspended in an upward moving gas stream such that the gas/solid particle mixture behaves like a fluid. In the bubbling fluidised bed boiler combustion takes place in a dense fluidised bed at the bottom of the furnace and above the bed. Small fuel particles burn rapidly above the fluidised bed, which is composed of sand, fuel and ash, while larger particles filter into the bed where they are dried and gasified. Sand is added to the fluidised bed to aid heat transfer. Residual char is burned mainly in the fluidised bed while volatile material burns both in the bed and directly above it.

The advantages of the fluidised bed boiler are that fuel moisture can vary greatly without adversely affecting the combustion process, and that the turbulent properties of the bed ensure efficient combustion. The rate of combustion is so high that the steam output can be adjusted rapidly by changing the fuel flow according to the load demand. In addition the combustion temperature is low enough to ensure that ash remains dust like and should not melt and stick to the heat transfer surfaces, thus increasing heat transfer efficiency.

The boiler proper consists of the following main components, a steam drum, gas-tight, membrane construction furnace walls, super-heaters and re-heater sections, economiser sections and a regenerative air pre-heater. The boiler is furnished with steam based soot blowers for the removal of ash deposits from the heat transfer surfaces.

The boiler peat feeding system consists of two intermediate day storage silos, located at the front side of the boiler house, and two feeding lines. The feeding lines from the silos transfer peat to both side walls of the boiler through a total of six fuel feeding chutes into the furnace.

A patented Hydro Beam air distributor is located at the bottom of the furnace. The Hydro Beam design features an extended free removal area, which allows the coarse material to be removed periodically from the bed. Hoppers located underneath the Hydro Beams collect the removed coarse material to water cooled screw conveyors and transfer it further onto a drag conveyor, which in turn transfers it to the pneumatic conveyor system. The material removed in this process is described as bottom ash and consists primarily of coarse material and sand. A screening system was installed during 2001 to allow sand to be screened from the bottom ash and returned to the sand silo for use as make-up sand for the boiler bed. This has helped to reduce the quantity of sand required annually for the boiler bed, and minimises the quantity of bottom ash material disposed of to landfill.

The fly ash is separated from the flue gas stream in the electrostatic precipitator (ESP). The fly ash is collected from the electrostatic precipitator hoppers by six pneumatic conveying units, which transfer fly ash to the fly ash storage silo. The fly ash silo is equipped with a moistened/dry ash discharging system. Fly ash is moistened during the fly ash unloading process to minimise dust emissions as the ash is discharged into the rail wagons for transportation to the ash disposal site.

In addition to the fly ash, ash from the 2nd and 3rd pass is sent pneumatically from both passes into the fly ash storage silo.

After the electrostatic precipitator there are two induced draught fans, one silencer and 70 meter high stack.

The boiler is equipped with a dry limestone injection system and a make-up sand feeding system to deliver fresh sand to the bed as required.

The fluidised bed boiler is equipped with four heavy fuel oil fired start-up burners located the side walls of the furnace. The oil burners are used at start-up to heat the bed (sand) to the temperature required to begin the peat firing. The start-up burners may also be used during normal operation to stabilise the combustion process if needed, due to the combustion of high moisture content peat.

Limestone Addition

Limestone is added to the boiler to reduce sulphur dioxide levels in the flue gas. During delivery limestone is fed pneumatically from the outside of the boiler house by means of a pressurised delivery tanker and through a feeding pipe into the limestone silo. The silo is equipped with a dust filter on the roof of the silo and it is located inside the boiler house on the left side of the boiler. Limestone is fed from the silo by one discharging screw and by one rotary feeder to the ejector. A high-pressure blower then blows the limestone into the furnace through injection pipelines at the front and back walls of the furnace. Modifications to the design of the distribution system were carried out during 2001 in order to get the best possible penetration and mixing of limestone in the furnace and to optimise the desulphurisation process. The limestone is currently being added through the tertiary air ducts in order to aid the distribution and mixing. The rate of injection is automatically controlled, according to the continuously monitored SO_2 levels in the flue gas stream, by adjusting the rotation speed of the discharging screw (inverter operated).

Electrostatic Precipitator

The electrostatic precipitator, which has a removal efficiency of approximately 99%, serves to remove fly ash from the flue gas prior to its discharge through the stack. The precipitator works by setting up a high voltage electrostatic charge in which the fly ash particles become charged and pass under influence of this charge to the collector electrode and hence into the fly ash hoppers. The flue gas, which will meet the 50mg/Nm^3 discharge limit, with regard to particulate content, then passes out through the stack.

Emissions

Emissions to air arising from the boiler consist of NOx, SO_x, dust and CO_2, and are emitted to atmosphere and dispersed through the 70m high stack.

The boiler also generates significant quantities of waste in the form of fly ash and bottom ash. The quantity of ash generated will not exceed 10% of the weight of the peat fuel consumed on a dry basis. The majority of this comes as fly ash amounting to approximately 70% of ash generated by the process.

Steam Turbine and Condenser

Live steam at 160 bar from the boiler is led through the main stop valve to the High Pressure/Intermediate Pressure (HP/IP) section of the steam turbine. The turbine is a two cylinder reheat condensing type, with a combined High Pressure (HP)/Intermediate Pressure (IP) cylinder and a separate single floor Low Pressure (LP) cylinder. After exiting the turbine high pressure section, with an exhaust pressure of 40 bar, the steam is fed to the re-heater section of the boiler, where the temperature is increased from 350ºC to 540ºC. The reheated steam is then fed to the IP section of the steam turbine, and the IP exhaust steam feeds the LP part of the steam turbine. Both live steam and re-heat steam temperatures are controlled by water injection, (attemperation).

The steam turbine exhausts into the condenser shell, which is located directly beneath the steam turbine. In the condenser the steam is condensed by cold circulating water from the cooling water circuit passing through the condenser tubes. The condenser is a box type surface condenser with a steam space of rectangular cross section to achieve optimum utilisation of the enclosed volume for the necessary condensing surface.

During steam turbine start up and shut down or in the event of the steam turbine tripping there is a steam turbine by-pass into the condenser in order that the boiler can be maintained above minimum load. The capacity of the by-pass is approximately 40% of the nominal steam flow.

The condensate from the condenser hot-well is pumped by means of two 100% condensate pumps into the feed water tank via the low pressure pre-heaters. The condensate level in the condenser hot-well is controlled and the minimum flow of the condensate pumps is maintained by a re-circulation line form the discharge side of the pumps back to the condenser hot-well.

The steam flow to the HP/IP and LP cylinder is controlled by combined emergency stop and control valves. The stop valves are isolating valves with a protective function and are triggered by protective devices to interrupt the steam flow under dangerous operating conditions. They are designed for high speed closing with maximum reliability. The control valves control the steam flow to the turbine according to a specified load or other operating conditions.

Alarms, commands and measurements from the steam turbine control and protection system are connected to the main plant control system so that the steam turbine can be operated and controlled through the monitors and operator terminals of the main control system. Control of the steam turbines auxiliary systems such as lubricating oil and generator cooling is also affected via the main control system.

Emissions

Process leakage and boiler blow down are discharged through blow down tanks, where they are combined with cooling water purge.

During the turbine plant start up larger quantities ($12m^3$/hr) of wastewater will arise. The turbine hall main piping hot drain will lead to the turbine hall blow-down vessel where it will be cooled to approximately 70^{o}C, by combination with cooling water, prior to discharge the site process effluent drainage system and then to the settlement pond.

It has been calculated that process leakage, boiler blow down, cooling waters and purge water are anticipated to give rise to approximately 320,000 m3 per annum of aqueous effluent.
The boiler will generate 100 kg/s of live steam at full load, which will be fed to the HP/IP turbine. The steam flow rate to the condenser will be 67 kg/s, the difference being mainly accounted for by steam diverted to the various pre-heaters in the plant.

Raw Water Supply

Surface Water Abstraction

The plant's primary cooling water requirements are met by the abstraction of water from the River Figile. The abstraction point is located downstream of the river's confluence with the River Phillipstown on an existing Offaly County Council site. The site is located 80m upstream of Clonbullogue Bridge, on the north bank of the River Figile in Clonbullogue village. The abstraction point is located approximately 4km downstream of the discharge point from the plant.

A condition of the Water Abstraction Consent, obtained from the Southern Regional Fisheries Board is that the rate of abstraction should not exceed 1/3 of the established Dry Weather Flow (DWF) at the abstraction point. The DWF is estimated at 720 m^3/hr (0.2m^3/s) based on information obtained from the Office of Public Works, which equates to a maximum abstraction rate of 240 m^3/hr (0.067 m^3/s).

Passive intake screens are located on or just above the riverbed, and fulfil the following conditions as dictated by the Southern Regional Fisheries Board:

- Approach velocity to the screen will be less than 7.5 cm/s.
- 10mm maximum inter bar spacing.
- Velocity of entry to the chamber shall not exceed 15 cm/s.
- Rate of abstraction will be uniform over a 24 hour period.

Three 200-300mm diameter pipelines will connect the intake screens to the wet well.

The pump house is located approximately 7m from the river bank and consists of a wet well and a valve chamber, with 2 x 100% capacity submersible pumps located in the wet well. The valve chamber is located adjacent to the wet well and contains non-return valves and gate valves on the rising main.

The pump house contains the electrical power, control panels, accumulators, air compressor/receiver tank, lifting beam and intruder alarm system. The accumulator is connected to the rising main to help reduce any pressure variations in the pipeline during pump changeover etc. The air compressor is used for periodic blowback of the screens to remove any debris. A hydroburst system, which blows water back through the screens periodically, was installed in 2003 to assist this process. The outlet pipe from the pump house is 250mm in diameter and follows a route of approximately 4km in length along the R401 from Clonbullogue to the EPL Power Plant.

Groundwater Abstraction

Two on-site wells have been drilled into the limestone aquifer at the site to provide a supplementary water supply, which is used for the production of de-mineralised water and is also used to provide the domestic supply to the site. The limestone aquifer has been the subject of a hydro geological investigation conducted by KT Cullen & Co. One of the test wells was capable of producing a yield of 400m^3/day, though only 120m^3/day is actually abstracted for de-min water production. .

Water Pre-treatment Plant

The raw water arriving from the river supply undergoes mechanical purification using a parallel dissolved air flotation unit and sand / anthracite filtration unit to remove suspended matter. River water generally contains high levels of organics; however they are not removed as they are not considered a problem with regard to using the water in the plant cooling system. The water leaving the flotation unit is channelled to the intermediate water tank by gravity.

From the intermediate tank the water is led into 3 de-alk units, to remove the alkalinity present. These decarbonisation units are regenerated periodically using HCl. The water leaving the decarbonisation units is led to a degasification unit, for CO_2 removal. The effluent from the regeneration process is fed to the neutralisation tank where it is pH neutralised prior to discharge to the settlement pond via W-1.

After degasification the pre-treated water may be divided into two separate flows. The major stream is transferred to the cooling tower as make up water. If the water quality is good enough the other stream may be led to two x 50% organic traps, from where the water is fed into the demineralisation plant or alternatively ground water is used for the production of de-mineralised water. In general due to the variation in river water quality ground water is used for the production of de-min water on-site.

Emissions

Aqueous emission arising from the periodic backwashing of the sand/anthracite filter are discharged to the dirty backwash tank, where settlement allows the back wash waters to be returned to the process, or discharged though the sites drainage system to the settlement pond. The frequency of backwashing, and therefore the volumes of backwash water vary considerably depending on raw water quality. At times raw water quality is such that backwashing is necessary every 3 -4 hours, though under normal circumstances backwashing is only required every 12 – 15 hours. Approximately 150 m^3 of effluent is produced per backwash, with the possibility that the major part of the backwash water can be returned into the process as feed water.

Water usage in the water treatment plant has been optimised under a programme in the EMP. As a result there has been a considerable reduction in water demand on site. The maximum water requirement, for 100% load and an ambient temperature of 20ºC, has been reduced from 240 m^3/hr to approximately 220 m^3/hr in the summertime, with the minimum requirement being reduced from 170 m^3/hr approximately 150 m^3/hr in wintertime.

Demineralisation Plant and Boiler Feed Water System

Feed water for the de-mineralisation plant is provided directly from the ground water supply or may be taken. from the pre-treated river water in the intermediate water storage tank The feed water is transferred to the demineralisation plant by 10m³/hr capacity centrifugal pumps. The average rate of supply from the demineralisation plant is approximately 4/5m^3 / hr. The plant itself consists of two identical 10 m³/hr streams. The plant is based on ion exchange technology consisting of a sequence of cation and anion resin beds with the following stages of treatment:

- Strongly acidic cation exchanger;
- Weakly basic anion exchanger;
- Strongly Basic anion exchanger;
- Mixed bed exchanger

As the demineralisation units are used the ion exchange resins become depleted and need to be regenerated periodically. The regeneration process involves using counter current flows of hydrochloric acid and sodium hydroxide solutions depending on the exchange resin in question. The effluent from the regeneration process is fed to the neutralisation tank where it is pH neutralised prior to discharge to the settlement pond via W-1.

The demineralised water is fed to the make-up water storage tank, which has a capacity of 700 m^3. The make-up water is fed to the feed water system via the make-up water pumps as required. The demineralised water is used to augment the quantity of water in the steam cycle, and to compensate for losses and boiler blow down.

The main function of the feed water system is to de-aerate the condensate returned from the condenser and to convey boiler feed water from the feed water tank to the boiler. It is essential to remove all oxygen from the feed water to prevent corrosion. The feed water tank is fitted with a de-aerator in which auxiliary steam is used to heat the feed water to 165ºC. The feed water is then fed into the boiler economiser where it is heated to 255ºC.

Emissions

The acid and alkali used to regenerate the ion exchange resins in the de-mineralisation and de-alkalisation plants is mixed together in the neutralisation chamber. The pH of the combined washings is generally acidic and therefore requires the addition of caustic for neutralisation purposes.

The de-mineralisation plant requires regeneration approximately once per day, with each regeneration operation producing 30m^3 of effluent. The through put through each of the three de-alkalisation units is approximately 2500 – 4000 m^3 between regenerations. Depending on raw water quality and demand approximately 250 – 350 m3 of neutralised effluent per day is produced in the water treatment plant.

Cooling Water Circuit

The main cooling water circuit provides cooling water to dissipate the waste heat from the condenser and consists of one main cooling water pump, a 7 cell evaporative induced draft cooling tower and cooling tower pond and valves and pipes between the cooling tower pond and the condenser. The cooling load at maximum output of 150 MW requires a cooling water flow of 14400m³/hr.

The auxiliary cooling water system comprises circulation pumps, heat exchangers and piping which convey heat from the various auxiliary cooling loads to the cooling tower. The estimated cooling load is 5 MW requiring a circulating water flow of 684 m³/hr.

Axial fans at deck level in the cooling tower induce ambient air through the side and end openings at the base of the tower. As the air flows through the main body of the tower, a PVC high efficiency film flow heat exchange medium exposes a maximum film surface area of circulating water to the cooler air draught thus transferring heat from the water to the air by evaporation. The circulating water is evenly distributed over the surface of the heat exchange medium using GRP/PVC pipe work and down spray nozzles.

The evaporation losses are approximately 1.0-1.3% of the main cooling water flow (144 – 190 m^3/hr) and are dependent on the ambient air temperature and relative humidity. This loss is replenished by make-up water. In addition there is a continuous purge of blow down water from the cooling tower to control the concentration of dissolved solids. This cooling water purge is also replaced with fresh make up water. The make up supply to the cooling tower is continuous during operations.

Cooling tower make up water is taken from the intermediate water storage tank and the alkalinity (carbonate hardness) is removed by the de-alkalisation plant. In addition, to prevent the build up of algae or other biomass growth on the cooling tower surfaces and scale on the heat transfer surfaces it is necessary to dose the cooling water with biocide and de-scaling agents. These agents degrade naturally in the environment.

Emissions

Emissions to atmosphere consist of water vapour evaporated from the cooling tower. This vapour does not in general form droplets or precipitate out, but does give rise to a visible plume in very cold or humid conditions.

The controlled cooling tower purge or blow down accounts for the greatest part of the aqueous discharges from the plant, which can be up to 35m³/hr under certain conditions. This is discharged to the settlement pond and thence to the River Figile. The discharge may contain residual quantities of dosing agents, which have degraded somewhat in the cooling tower and cooling water circuit, and degrade further when resident in the settlement pond.

Settlement Pond

All effluent streams from the plant, with the exception the effluent from the Bord na Mona Puraflo foul sewage treatment system, as well as all surface water discharges, are discharged to the River Figile via the site's settlement pond. The capacity of the settlement pond is 3,000m^3, its primary function being to allow suspended solids, particularly particles of peat entrained in the surface water run-off and wash waters, to settle out prior to discharge to the river.

The settlement pond also acts as a cooling pond for the cooling tower and boiler blow-down streams, reducing the level of thermal discharges to the river.

Furthermore the levels of dosed chemicals which degrade naturally reduce while the discharges are resident in the settlement pond. In particular this is true of residual halogen levels arising from the cooling tower blow-down.

The discharge rate from the settlement pond will be proportional to the water level in the pond and therefore to the rate of discharge into the pond. A sluice gate has been installed at the weir wall discharge from the pond to the river allowing discharges to be stopped if necessary.

The total effluent discharge from the site usually average about 25-35m^3/hr and are very dependent on various process conditions, such as back-washing and resin regeneration frequencies, blow down and purge rates. The flow can increase to a maximum of 160m^3/hr for short periods during discharge of neutralisation basin effluent to the settlement pond, or during soot blowing. The quality and quantity of process water produced on site is monitored at Emission Point Reference No. W-1, which is located at the end of the process effluent drainage system, prior to the effluent entering the settlement pond pumping chamber.

Surface run-off water is also discharged via the settlement pond, the flow rate of this contribution to the discharge being dependent on rainfall levels. The quality and quantity of the combined process effluent and surface waters collected in the settlement pond is monitored at Emission Point Reference No. SW-1, which is located at the weir wall discharge point from the settlement pond to the River Figile.

1.2 ENVIRONMENTAL POLICY

Edenderry Power Ltd. is a wholly owned subsidiary of Bord na Mona Ltd. Following a change of ownership in December 2006 Edenderry Power Ltd. transferred the Operation and Maintenance (O & M) Contract to Edenderry Power Operations Ltd. The Contract requires Edenderry Power Operations Ltd as a reasonable and prudent operator to:

- maximise availability and efficiency of the power plant
- minimise the incidence, severity and duration of forced outages
- prevent premature deterioration of the power plant
- comply with applicable legal, environmental, health and safety requirements

on behalf of Edenderry Power Ltd.

Edenderry Power Operations Ltd is committed to a policy of continual improvement of the power plant it operates and maintains, and places a significant emphasis on its environmental responsibilities, as indicated in its Environmental Policy Statement:

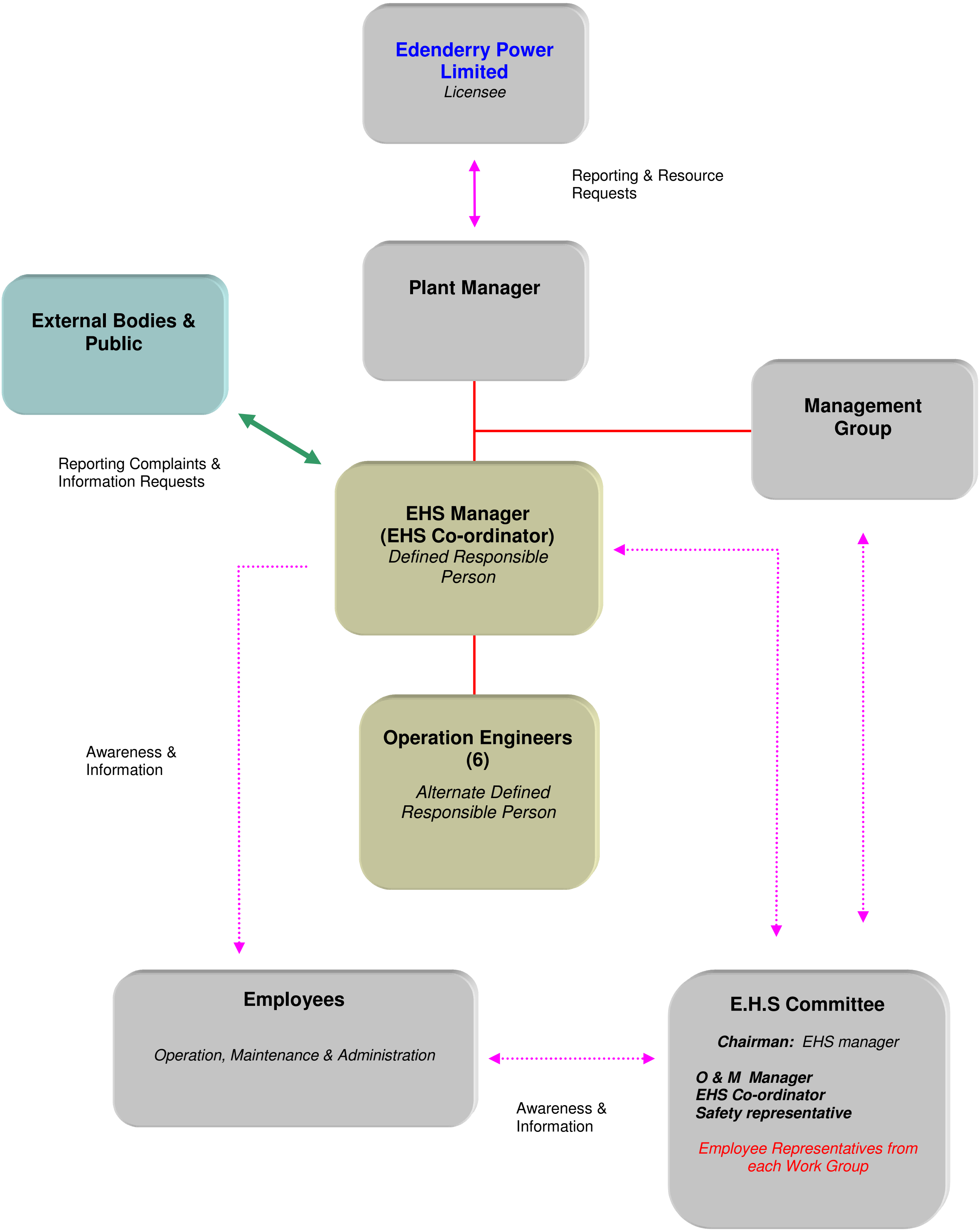
Policy Statement

In Operating and Maintaining Edenderry Power Plant we are conscious of the effects of our activities on the environment and will:

- meet and where possible exceed, the requirements of all applicable legislation and regulations
- comply with Corporate Policies & Standards and any other requirements to which our organisation subscribes which relate to its environmental aspects
- establish objectives, against which targets are set for the implementation of this policy
- continually improve our environmental performance
- implement measures to prevent pollution
- optimise the consumption of energy and minimise waste
- work with contractors and suppliers to improve their environmental performance
- provide the necessary training and support to employees to ensure these commitments are fulfilled
- ensure adequate resources are allocated for the implementation of the policy

An Environmental Management System (EMS) is maintained in order to ensure compliance with the company’s integrated pollution, prevention and control licence (IPPC licence), relevant environmental statutory requirements, corporate and other requirements, and to identify, and thus minimise or eliminate where possible, significant environmental impacts.

1.3 ENVIRONMENTAL MANAGEMENT ORGANISATION CHART



1.3 ENVIRONMENTAL MANAGEMENT ORGANISATION CHART (Cont)

The Environmental, Health and Safety Manager is appointed by Edenderry Power Ltd.'s Plant Manager as the specific Edenderry Power Operations Limited representative who, irrespective of other responsibilities, is responsible and has authority for ensuring that the Environmental Management System and Health & Safety Management System requirements are established, implemented and maintained.

The EHS Manager is responsible for the overall operation of the Environmental Management System and for reporting to senior management the performance of the System. The E.H.S. Co-ordinator assists the E.H.S. Manager with the day to day operation if the Environmental Management System. The E.H.S. Committee, which includes members of the Senior Management team, namely the EHS Manager, as its chairperson, and the Operations and Maintenance Manager, is a cross functional team that assists in the day to day operation of the Environmental Management System. The E.H.S Committee reviews the operation of the EMS on an ongoing basis and implements process improvements or corrective actions where necessary. The E.H.S Committee also may review, propose and agrees changes to both the EMS and the EMP annually.

The EHS Manager, or designated deputy, generally the Duty Operation Engineer, is available to meet with representatives of the Environmental Protection Agency or other authorities or members of the public at all reasonable times.

Resource requirements are identified and approved as part of the Environmental Management Programme development. Edenderry Power Limited is committed to providing adequate resources and personnel for the effective operation of the Environmental Management System.

2.0 SUMARY INFORMATION

2.1 Emissions To Water

2.1.1 SW-1 Weir Wall Discharge

The combined process effluent and surface water flows from the site collect in the settlement pond pumping chamber from where they are pumped to the settlement pond for retention prior to discharge of the combined streams to the river Figile. The Weir Wall discharge point from the settlement pond to the river Figile is designated as Emission Point Reference No. SW-1. This is for the purpose of sampling and monitoring to meet the requirements of Schedule C.2.3 of the IPPC Licence.

The Damatic Control System (DCS) and Exis System continuously monitor the following parameters at the Discharge Point SW-1, located at the weir wall discharge point of the plant settlement pond.

- Temperature (^{0}C)
- Flow (Kg/s)
- pH
- Conductivity (uS/cm)
- Turbidity NTU
- TOC mg/l

A composite sampler is installed at the monitoring point and is connected to the flow meter allowing 24 hour flow proportional samples of the discharge to be sampled as necessary. The IPPC Licence requires only monthly sampling of the discharge at this point. However, as the discharge at this point is a combined process effluent and surface water discharge weekly sampling was carried out at this point during 2008, for certain parameters.

Forty seven composite samples were collected and analysed from Emission Point Reference No. SW-1 in 2008. The analysis of the samples was carried out at Bord na Mona Environmental Consultancy Services Ltd.’s accredited laboratory in Newbridge, Co. Kildare.

2.1.2 W-1 Effluent Sampling Chamber

The combined process effluent flow from the process, including boiler blow down, water treatment plant effluent and cooling water purge, passes through an effluent sampling chamber prior to discharging in to the settlement pond pumping chamber. The Effluent Sampling Chamber prior to the settlement pond pumping chamber is designated as Emission Point Reference No. W-1. This is for the purpose of sampling and monitoring to meet the requirements of Schedules B.2 and C.2.2 of the IPPC Licence.

The Damatic Control System (DCS) and Exis System continuously monitor the following parameters at the Effluent Sampling Chamber W-1. The temperature up-stream and down stream of the discharge point to the River Figile is also monitored on a continuous basis and is linked to the DCS and Exis Systems.

- Temperature (^{0}C)
- Flow (m^3/hr)
- pH
- Conductivity (uS/cm)

A composite sampler is installed at the monitoring point and is connected to the flow meter allowing 24 hour flow proportional samples of the discharge to be sampled as necessary. Weekly sampling of the process effluent was carried out at this point during 2008.

Forty seven samples were collected and analysed from Emission Point Reference No. W-1 in 2008. The analysis of the samples was carried out at Bord na Mona Environmental Consultancy Services Ltd.'s accredited laboratory in Newbridge, Co. Kildare.

MASS EMISSION CALCULATION AND TABLE

A flow meter is installed at Emission Point Reference No. W-1, and is connected to the plants main control system, allowing accurate flow measurements to be recorded and tracked at this monitoring point. The flow data recorded during flow proportional composite sampling events at Emission Point Reference No. W-1 for the period from January 1st to December 31st 2008 indicates that the average flow at the monitoring point was 26.6m^3/hr, with a maximum flow recorded of 63.1m^3/hr. The process effluent flow varies and depends on the state of the process. There are a number of processes contributing to the total process effluent flow, namely boiler blow-down, cooling water purge, discharges form the water treatment plant neutralisation basin and cooling water required to cool the boiler blow-down.

The rate of boiler blow-down and cooling water purge are controlled, but depend on the quality of the boiler and cooling water. The quantity of cooling water required to cool boiler blow-down is automatically controlled and varies widely depending on the state of the process. Discharges from the water treatment plant are dependant on the quantity of cooling water make-up required to maintain the process in equilibrium and will be higher in the summer period as ambient temperatures increase the rate of evaporative loss across the cooling towers.

For the purpose of mass emission calculations for 2008, from Emission Point Reference No. W-1, the actual average flow over the 24 hour period during which the composite sample was collected has been recorded from available operational data. The calculated mass emissions are based on the analysis of the weekly samples collected at the monitoring point. Daily mass emissions were determined from the analysis of the weekly samples on the basis of an average flow in m^3/hr recorded over the sampling period, with weekly mass emissions being estimated by multiplying the daily figure by 7. Where monthly sampling only is required by the IPPC Licence, a similar approach is undertaken to determine mass emissions over the intervening period between analyses.

The mass emissions determined for Emission Point Reference No. W-1 is detailed in Table 1 below.

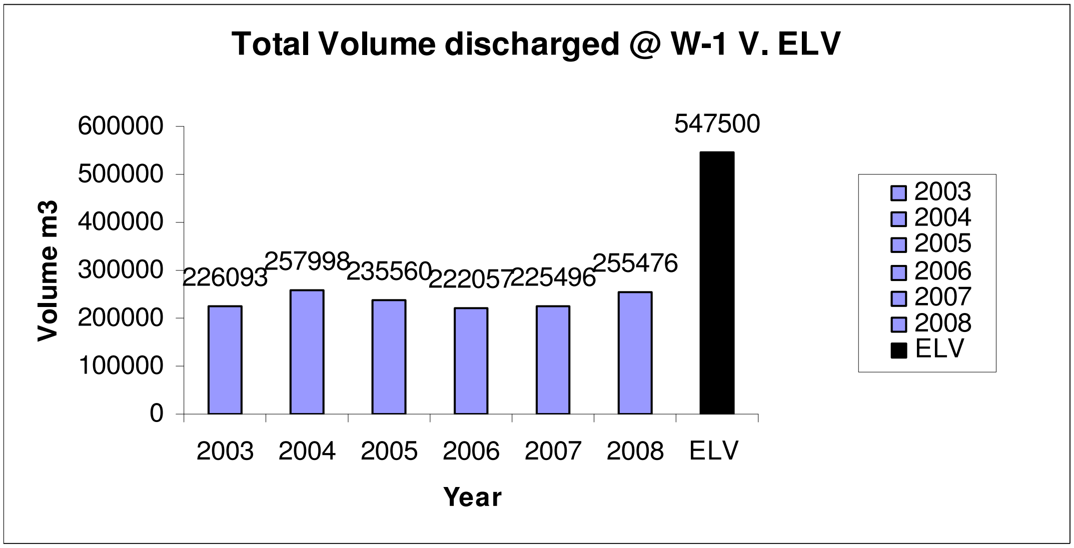
Table 1: W-1 Mass Emissions 2008

Parameter	Mass Emissions Kg/Yr	Licensed Mass Emission Kg/Yr
Volume (m^3)	255,476	547,500 m^3
BOD	531.6	7,300
Ammonia-N	136.0	1,460
Total Phosphorus	28.9	58.4
Suspended Solids	8,919.7	58,400
Total Dissolved Solids	647,913.7	2,190,000
Total Dissolved Solids Net (less incoming)*	208,393.9*	-
Mineral oils	2.3	5,840
Diesel Range organics (DRO)	3.214	-
Petroleum Range Organics (PRO)	2.282	-
Nitrate-N	1,773.1	-
Oils, Fats & Greases	1,283.7	2,920
Total Kjeldal Nitrogen	1,798.8	-

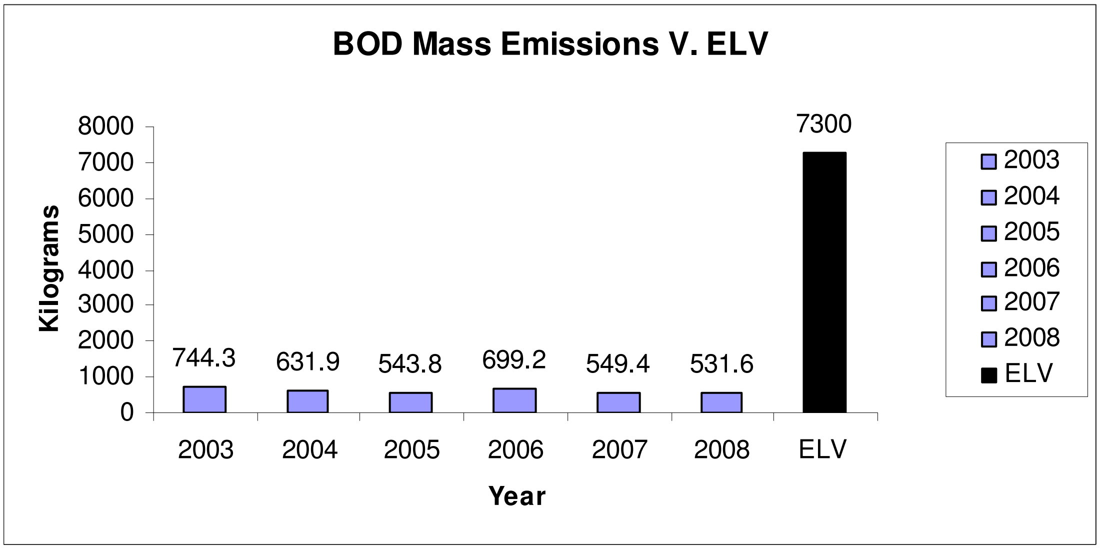
*Effluent TDS mass emission value less the incoming raw water TDS mass emissions value. Due to a calculation error the figure in the electronic PRTR is incorrect.

The mass emissions of significant licence parameters against their corresponding emission limit values for 2003 to 2008 are detailed in graphs A - G below

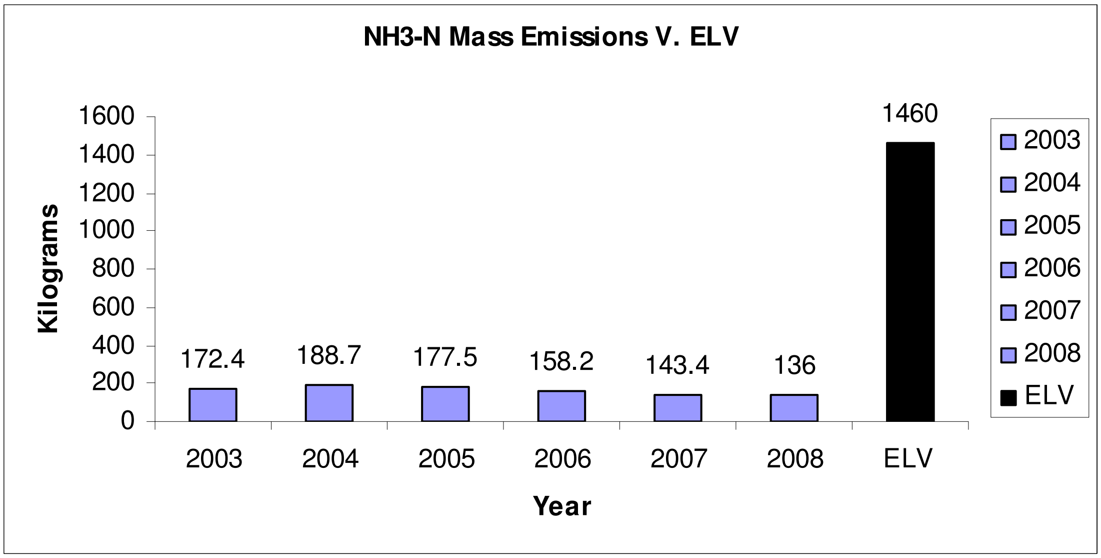
A


Total Volume discharged @ W-1 V. ELV
Volume m3
600000
500000
400000
300000
200000
100000
0
226093
257998
235560
222057
225496
255476
547500
2003
2004
2005
2006
2007
2008
ELV
Year
2003
2004
2005
2006
2007
2008
ELV

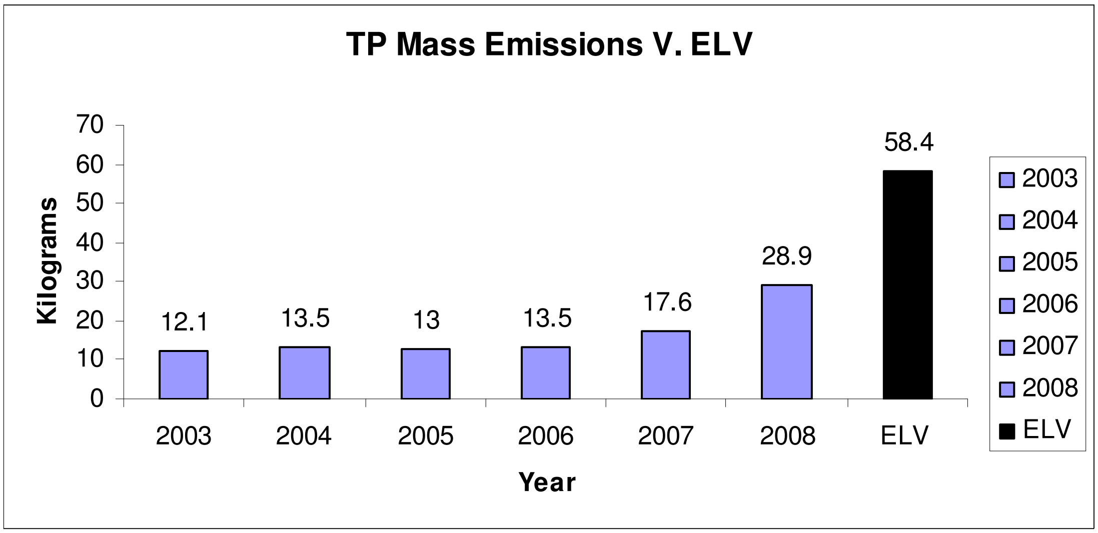
B


BOD Mass Emissions V. ELV
Kilograms
8000
7000
6000
5000
4000
3000
2000
1000
0
744.3
631.9
543.8
699.2
549.4
531.6
7300
2003
2004
2005
2006
2007
2008
ELV
Year
2003
2004
2005
2006
2007
2008
ELV

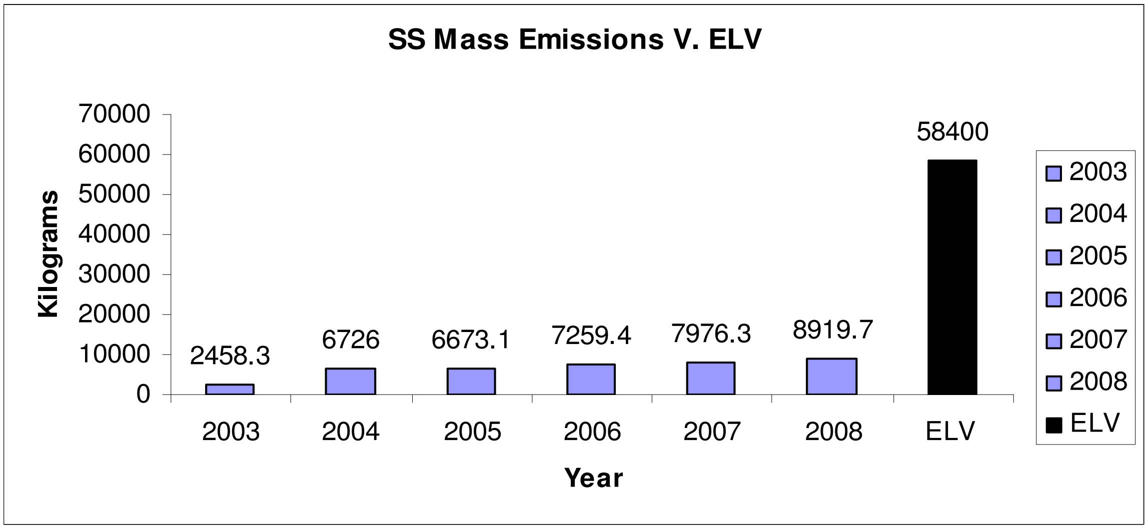
C


NH3-N Mass Emissions V. ELV
Kilograms
1600
1400
1200
1000
800
600
400
200
0
172.4
188.7
177.5
158.2
143.4
136
1460
2003
2004
2005
2006
2007
2008
ELV
Year
2003
2004
2005
2006
2007
2008
ELV

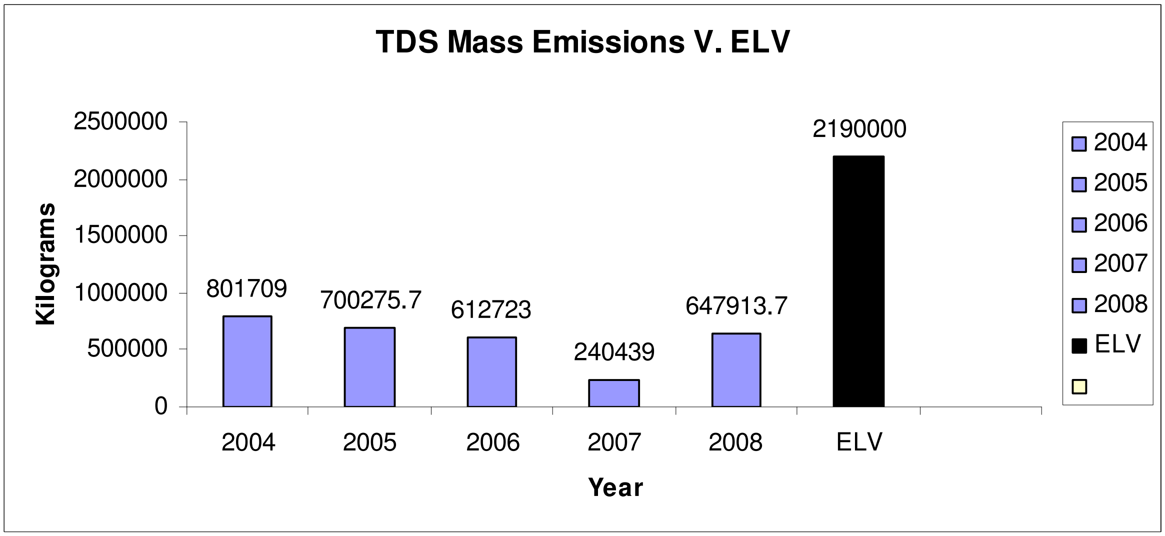
D


TP Mass Emissions V. ELV
Kilograms
70
60
50
40
30
20
10
0
12.1
13.5
13
13.5
17.6
28.9
58.4
2003
2004
2005
2006
2007
2008
ELV
Year
2003
2004
2005
2006
2007
2008
ELV

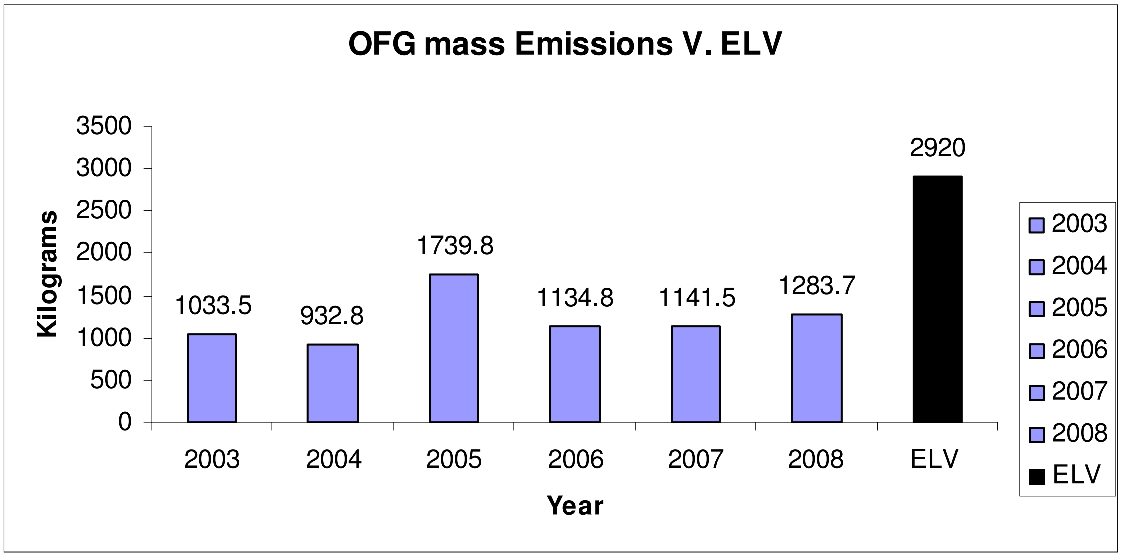
E


SS Mass Emissions V. ELV
Kilograms
70000
60000
50000
40000
30000
20000
10000
0
2458.3
6726
6673.1
7259.4
7976.3
8919.7
58400
2003
2004
2005
2006
2007
2008
ELV
Year
2003
2004
2005
2006
2007
2008
ELV

F


TDS Mass Emissions V. ELV
Kilograms
2500000
2000000
1500000
1000000
500000
0
801709
700275.7
612723
240439
647913.7
2190000
2004
2005
2006
2007
2008
ELV
Year
2004
2005
2006
2007
2008
ELV

G



2.1.3 River Water Monitoring

Analysis of the River Figile upstream and downstream of the discharge point from the site's settlement pond was carried out in May and November 2008 to meet the requirements of Schedule C.6.1 of the IPPC Licence. The results of the analysis of the river water samples are detailed in Table 2 below.

Table 2: River Water Monitoring 2008

Date		pH	Cond.	Temp °C	DO mg/l	BOD mg/l	NH_3-N mg/l	PO_4-P mg/l	S.S. mg/l	TDS mg/l	NO_2-N mg/l	NO_3-N mg/l	TOC mg/l
07/05/08	US	8.2	620	18.1	9.5	3	0.25	0.02	6	320	<0.02	2.01	19
07/05/08	DS	8.2	821	18.9	9.8	3	0.33	0.02	6	412	<0.02	2.71	22
20/11/08	US	7.7	476	*	*	<2	<0.02	0.06	<5	364	<0.02	1.88	26
20/11/08	DS	7.7	498	*	*	2	0.14	0.05	7	284	<0.02	1.7	27

Key:
US = Upstream DS = Downstream * Instrument unavailable

2.1.4 Puraflo Monitoring

Analysis of effluent from the site's Puraflo biofiltration system was carried out in May and November 2008 to meet the requirements of Schedule C.7 of the IPPC Licence. The results of the analysis of the Puraflo samples are detailed in Table 3 below. All results were with their respective ELV.

Table 3: Puraflo Effluent Monitoring 2008

Date	BOD mg/l	NH_3-N mg/l	S.S. mg/l
08/05/2008	11	31	7
20/11/2008	8	22	11
ELV	25	-	25

2.1.5 Groundwater Monitoring

Analysis of groundwater from the site's two monitoring boreholes, GW1 and GW2, was carried out in May and November 2008 to meet the requirements of Schedule C.6.2 of the IPPC Licence. The results of the analysis of the groundwater samples are detailed in Table 4 below.

Table 4: Groundwater Monitoring 2008

Date	Emission Point Ref No.	pH	Hardness mg/l	Organohalogens USEPA 524.42ug/l
08/05/2008	GW1	8.2	180	<10
08/05/2008	GW2	8.4	178	<10
20/11/2008	GW1	8.1	181	<10
20/11/2008	GW2	8.2	179	<10

2.1.6 Non-Compliances

There were no non-compliances recorded in 2008.

During the course of 2008, 47 individual samples of process effluent were sampled at emission point reference no. W-1.

2.2 Emissions To Atmosphere

The main flue gas stack on site is designated Emission Point Reference No. A1-1. This is for the purpose of sampling and monitoring of emissions to atmosphere to meet the requirements of Schedule Band C.1 of the IPPC Licence.

The Damatic Control System (DCS) and Exis System continuously monitor the following parameters in the flue gas stack stack. The stack monitoring point is located after the electrostatic precipitator.

- Temperature (^{0}C)
- Pressure (kPa)
- Flow (m^3/s)
- H_20 %
- O_2 %
- NO (mg/Nm^3)
- NO_2 (mg/Nm^3)
- SO_2 (mg/Nm^3)
- Dust (mg/Nm^3)

The in-stack flue gas analysers were originally installed, calibrated and commissioned by Moeller Electric Oy, Finland, as detailed in documents P-1489, Flue Gas Analysers Documentation and EDEN-A4-17, Automation and Instrumentation, Emission Measurement. These systems are calibrated and maintained annually by Erwin Sick Ltd UK .

Additionally in 2008, as required under EN 14181, a QAL2 Calibration was carried out Protea Ltd (UK) Calibration values were determined and applied to the system as indicated in the summary in Appendix 3, accompanied by a full copy of the Protea compiled Report in Appendix 1.

All raw measurements are taken inside the stack, with no sample being withdrawn from the flue gas stream.

The raw mA signal outputs from the in-stack analysers are sent to the CDAS reporting system where the signal is reported as raw data. The raw data is then corrected by the CDAS software system in order to report the corrected data on a dry gas basis, normalised for temperature (273K) and pressure (101.3kPa) and reported at 6% oxygen. The final validated data is calculated by subtracting the 95% confidence intervals, determined from the stated accuracy of the analysers, from the corrected data. NOx emissions are calculated by summing the measured NO and NO_2 values.

The validated data is compared to the ELV's detailed in the IPPC Licence, on a 48 hourly and monthly basis as required by the IPPC Licence. A summary of the mass emissions to atmosphere from emission point reference no. A1-1 is detailed in Table 6 below.

Table 6: A1-1 Mass Emissions to Atmosphere 2008

Parameter	Mass Emissions Kg/Yr	Licensed Mass Emissions Kg/Yr
Sulphur Dioxide (SO_2)	1,923,800	2,549,160
Nitrogen Dioxide (NO_2)	761,600	1,380,795
Particulates (Dust)	89,600	212,430
Carbon Dioxide (CO_2)	895,057*	632,319**

- *CO_2 given in tonnes/yr
- **Cap under EU ETS NAPI Allocation

Table 7 below summarises the mass emissions calculated for each month in 2008. 2008 CO_2 emissions data has been calculated using the agreed methodology detailed to the Agency as part of Edenderry Power Ltd.'s Monitoring & Reporting Plan Version 4 approved by the Competent Authority 29th January 2008 pursuant to Greenhouse Gas Emissions Permit IE-GHG007-03. Reported CO_2 emissions include all CO_2 emissions from the plant, including process related emissions.

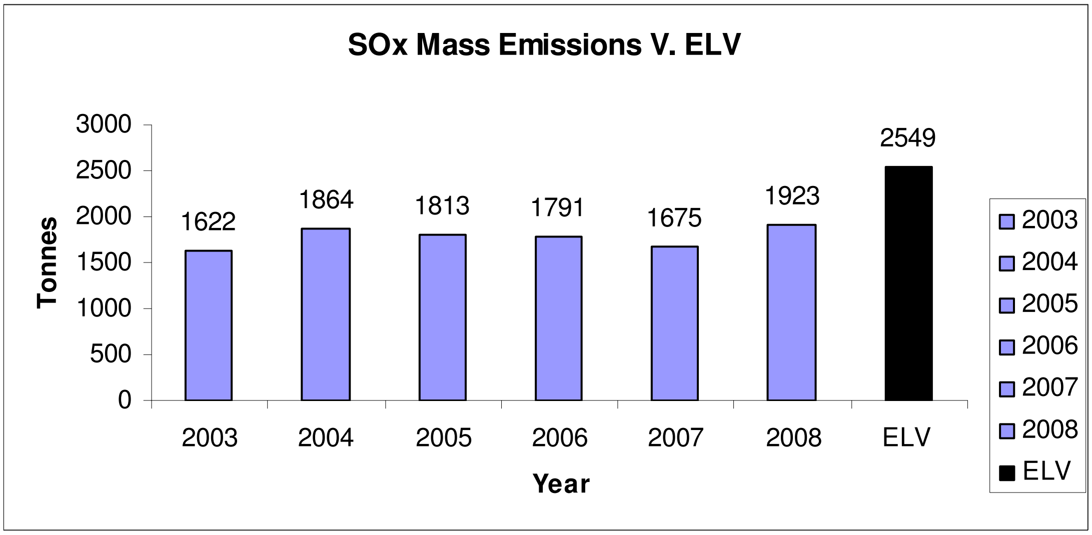
The hourly average and total daily mass emissions of NOx, SOx and dust are calculated from the validated daily average values and the validated daily average flue gas flow.

Table 7: Mass Emissions to Atmosphere 2008

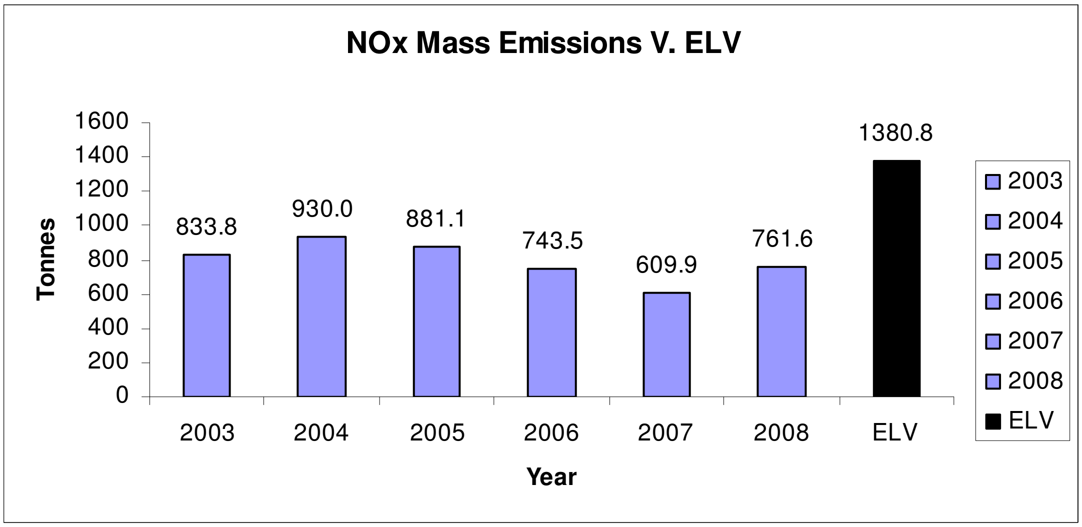
Month	SO_2 Kg	NO_2 Kg	Dust Kg	SO_2 Tonnes	NO_2 Tonnes	Dust Tonnes
January	191900.0	73400.0	12900.0	191.9	73.4	12.9
February	182400.0	69500.0	11100.0	182.4	69.5	11.1
March	193400.0	72100.0	11000.0	193.4	72.1	11.0
April	150000.0	53700.0	6200.0	150.0	53.7	6.2
May	188000.0	69800.0	7200.0	188.0	69.8	7.2
June	180400.0	68700.0	7300.0	180.4	68.7	7.3
July	59600.0	23000.0	2000.0	59.6	23.0	2.0
August	69600.0	27500.0	2000.0	69.6	27.5	2.0
September	183100.0	77300.0	5800.0	183.1	77.3	5.8
October	181700.0	78800.0	8800.0	181.7	78.8	8.8
November	187000.0	79900.0	9100.0	187.0	79.9	9.1
December	156700.0	67900.0	6200.0	156.7	67.9	6.2
Total:	1923800.0	761600.0	89600.0	1923.8	761.6	89.6

The mass emissions of significant licence parameters against their corresponding emission limit values for 2003 to 2008 are detailed in graphs H - J below

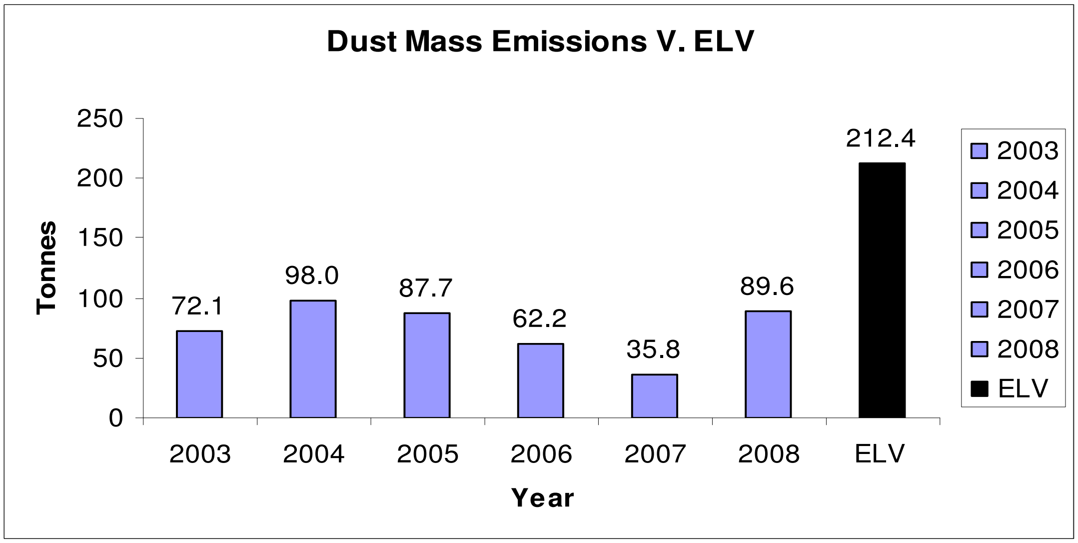
H



I



J



2.2.1 Summary of 48 hour and monthly mean emission value calculations for SOx, NOx and Dust

The CDAS system calculates the daily average and 48 hour value for all parameters. The new reporting system automatically calculates the 48 hour emission values, reducing the need for manual calculation and there for the potential for human error. It also calculates the maximum allowable target for both the following day and for the each month as a whole. All of this information is contained on a single sheet which automatically prints at midnight each night. The new system has greatly reduced the risk of any potential breach in our ELV's from simple human miscalculation.

Following a suitable period of validation the use of the "48 hourly Mean Emission Limit Calculator" spreadsheet has been dropped from the standard procedures.

Calculated 48 hourly emissions data is not used to calculate mass emissions.

The Operations team continuously monitors the plant emissions, along with the other continuously monitored parameters to ensure that 48 hourly and monthly emission limits are not exceeded. The Operations and EHS Manager are contacted as soon as possible, should the measured values exceed the emission limit values, or if a fault is detected with the on-line monitoring equipment.

All 48 hour values exceeding limits as stated under conditions 4.1.1.2. and 4.1.1.3 of the licence will be investigated. Should the numbers of 48 hour average values exceeding their corresponding limits remain under 97% of the total 48hr SOx or dust values, and 95% of the total 48hr NOx values, these occurrences will not be notified to the Agency under section 11. These values will be noted in the AER. Details of the investigations and any corrective actions will be filed and will be available for inspection.

The 48hr ELV's as determined under conditions 4.1.1.2. and 4.1.1.3 of the licence are as follows:

SOx – 660 mg/m^3
NOx – 325 mg/m^3
Dust – 55 mg/m^3

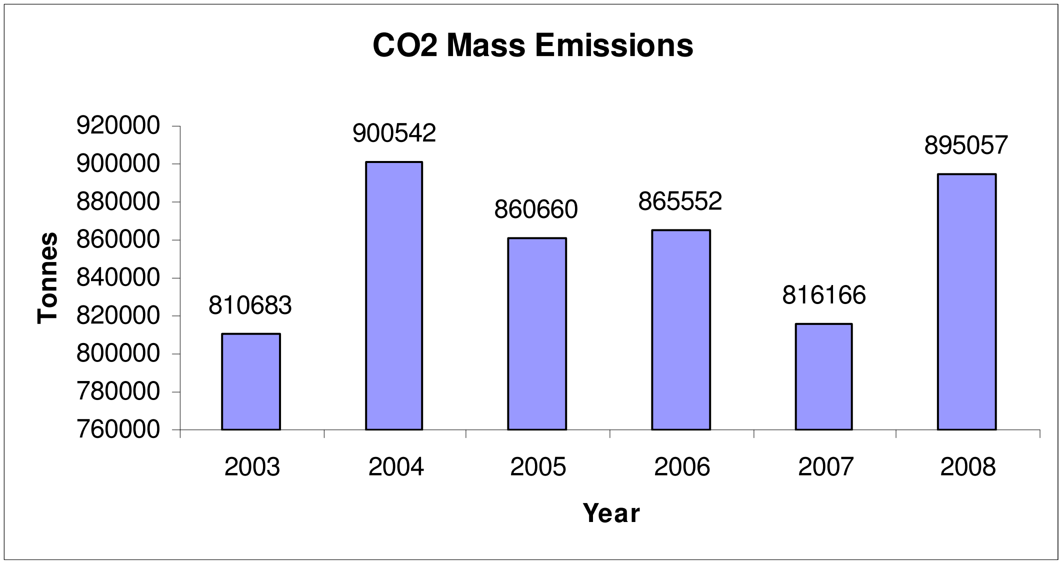
In 2008 the SOx 48hr ELV was exceeded on only one occasion, on the 26/12/08, however the value was within the allowed 3% under condition 4.1.1.2 of the licence.

2.2.2 CO_2 Emissions Calculations

Approval of methodology for calculating CO_2 emissions for 2008 is based on Edenderry Power Ltd.'s Monitoring & Reporting Plan Version 4 approved by the Competent Authority 29th January 2008. Emissions for 2008 have been calculated using this approved methodology and verified by CICS on 17th of February 2009.

Annual CO_2 emissions from 2003 to 2008 are shown below in graph K

K



2.2.3 Non-Compliances

There were no section 4 or 11 notifications regarding emissions to air, issued to the Environmental Protection Agency, in terms of non-compliance with IPPC Licence conditions during the course of 2008.

2.2.4 Licence Review

Due to the reclassification of MBM and the planned upgrade of the plant to include a Peaking Plant, a review of the licence was undertaken in late 2008 to incorporate these changes and to clear some other minor anomalies in the current licence, these included:-

- W-1 Temperature requirements
- External Stack Monitoring Emission Limit requirements
- Requirements for PM 10 / 2.5 analysis

2.3 Waste Arising

Waste generated on-site during operations in 2008 has been divided into two main categories, namely Hazardous and Non-Hazardous waste.
Table 8, below summaries the quantity and type of waste produced on site during 2008.

Table 8: Waste Summary

	Tonnes 2008
Total Waste Produced	33217.46
Waste Disposed of on-site	0
Waste Disposed of off-site	33165.4
Waste Recovered on-site	0.49
Waste Recovered off-site	51.5

Table 9 below details the Hazardous Waste produced in 2008, including the EWC Code for each category of waste, and indicates the disposal/recovery route for the waste using the D&R Codes.

Table 9: Hazardous Waste Summary

EWC Code	Waste Description	Tonnes 2008	D/R Code
20 01 21	Fluorescent Lamps	0.1	R5
13 02 06	Waste oil	1.83	D9
15 02 02	Solid oily waste	0.88	R1
08 01 11	Kerosene	0.45	R1
16 06 04	Batteries	0.023	R5
16 05 06	Chemical waste	0.162	R1/D9
20 01 35	Computers	0.16	R5

Table 10 below details the Other Waste (non-Hazardous) produced in 2008, including the EWC code for each category of waste, and indicates the disposal/recovery route for the waste using the D&R Codes.

Table 10: Other Waste (Non-Hazardous) Summary

EWC Code	Waste Description	Tonnes 2008	D/R Code
10 01 01	Bottom Ash	5,565	D5
10 01 03	Fly Ash	27,483.5	D5
20 03 01	Mixed municipal waste	62.33	D1
20 01 08	Bio-kitchen and canteen waste	0.491	R10
20 03 04	Puraflo Septic Tank Sludge	53.6	D9
20 01 39	Plastics	0.061	R5
20 01 01	Paper/cardboard	2.175	R13
16 01 17	Metal waste	46.66	R4
20 01 39	Ink cartridges	0.04	R5

A waste register is maintained on-site, which details the names of the agent, transporters, person responsible for the ultimate disposal/recovery of the waste, and the ultimate destination of the waste. The Register also contains written confirmation of the acceptance and disposal/recovery of the hazardous waste consignments sent off-site in 2008.

There were no rejected consignments of waste removed from the site in 2008.

Details of the waste licence & permit numbers of the waste contractors used on site are contained in the waste section of the Electronic PRTR attached in Appendix 4.

2.4 Energy, Water and Resource Consumption

2.4.1 Energy Consumption 2008

The primary fuel consumed in the process is peat, with approximately 924,381 weighed tonnes used during 2008. On the basis of laboratory determined moisture and gross calorific values determined on composite samples of the peat delivered, this equated to 1,009,949 Energy Tonnes of peat.

Approximately 17,734 weighed tonnes of biomass woodchip was consumed as fuel in the process in 2008. This equated to 19,093 Energy Tonnes of biomass.

Medium fuel oil (MFO) and gas oil have been used during start-ups and about 9.5% of electricity generated is required to satisfy the house-load. Table 12, below summarises the energy consumption associated with operations in 2008, during which 729,999 MW of electrical power was exported to the National Grid.

Limestone and sand are also used in the process and quantities consumed during 2008 are detailed in Table 11, below.

Table 11: Energy & Material Consumption 2008

	Quantity Tonnes	MW
Peat	924,381	2,160,169
Medium Fuel Oil	84.037	0.96
Gas Oil	57.216	0.69
Biomass	17,734	40,838
Electricity (Imported)	-	82,815
Limestone	4810.1	-
Sand	1830.8	-

Table 12, below summarises the gross energy production, and energy consumed during each month in 2008.

Table 12: Electricity Production & Consumption 2008

Month	Energy Produced MWhrs	Energy Consumed MWhrs
January	87,992.00	8,032.90
February	84,938.00	7,668.40
March	87,646.00	8,047.10
April	71,055.00	6,668.60
May	88,308.00	7,902.60
June	84,292.00	7,695.80
July	25,760.00	2,856.00
August	31,129.00	3,454.30
September	85,635.00	7,761.80
October	89,654.00	8,083.90
November	84,899.00	7,773.00
December	74,046.00	6,870.10
Total:	895,354	82,814.5

2.4.2 Water Consumption 2008

There are two sources of water used in the process. River water from the River Figile is used for the production of cooling water, while groundwater from an on-site bore hole is used for the production of de-mineralised water for use in the plants boiler, and for the domestic supply on the site. There is no municipal water supply to the site.

Table 13, below, details water consumption volumes for 2008, with the individual consumption rates for each month detailed in Table 14.

Table 13: Water Consumption 2008

Description	m^3
On-site Ground Water	25,026.2
On-site Surface Water	1,328,733.5

Table 14: Monthly Water Consumption Rates 2008

Month	River Water (m^3)	Well Water (m^3)	Total (m^3)
January	119411.4	2593.6	122005.0
February	118088.8	1826.7	119915.5
March	125616.8	2515.2	128132.0
April	105674.6	2842.6	108517.2
May	143525.9	1872.9	145398.8
June	139063.0	1660.3	140723.3
July	44918.1	344.7	45262.8
August	54843.4	3734.9	58578.3
September	132306.8	1926.4	134233.2
October	131763.9	1892.6	133656.5
November	117308.9	1840.0	119148.9
December	96211.9	1976.3	98188.2
Total:	1328733.5	25026.2	1353759.7

There has been approximately a 21% reduction in total water consumption per unit output from the plant, when compared with the 2001 consumption rates.

2.5 Environmental Incidents and Complaints

2.5.2 Environmental Incidents 2008

There were no environmental incidents occurring on site in 2008 which were reportable to the Agency.

2.5.3 Environmental Complaints 2008

Table 15: Environmental Complaints Summary 2007

DATE	Category	Details	Corrective Action	Report to EPA
27/08/08	Emissions to water	Complaint made to the EPA via local IFA representative with regards to an oily residue on the river figile in Clonbullogue	No corrective action required. The complaint was found to be unsubstantiated and most likely caused by localised flooding downstream unrelated to the plant operation.	EPA notified by email

One complaint was received in relation to plant activities in 2008. Table 15 above gives a summery of the complaint. Agency notified by email and the complaint was found to be unsubstantiated.

2.6 Agency Monitoring and Enforcement

Representatives of the Environmental Protection Agency visited the site on a number of occasions during 2008. Details of these visits are outlined in table 16 below.

Table 16: Site visits Summary 2008

Date	Representative	Nature of visit	Compliance Details
15/02/08	EPA Inspector	Annual inspection	No non-conformances
24/04/08	EPA	Compliance monitoring (water)	No non-conformances
18/08/08	EPA	Compliance monitoring (water)	Plant offline. Sample not possible
16/12/08	EPA	Green House Gas Inspection	No non-conformances

On all unannounced water sampling visits, where samples were taken, split samples were given to EPOL.

Results from compliance monitoring showed compliance with all parameters.

3.0 MANAGEMENT OF ACTIVITY

3.1 Schedule of Objectives & Targets 2009 – 2013

The Schedule of Objectives and Targets covering the 5 year period from 2009 to 2013 includes 3 programmes which are summarised in Table 17 below.

Table 17: Objectives & Targets 2009-2013 Summary

Programme No.	Programme Title	Programme Objective
EMP-02	Landfill Reduction	Reduce bottom ash going to landfill by continuing to evaluate potential of fly ash as a soil additive
EMP-11	Emissions to Atmosphere of CO_2 (GHG)	Reduction in Net Emissions of Key Green House Gas CO_2 , continue to work with BnM Energy to develop supply chain for wood biomass. Develop plan for implementation of MBM co firing. Reduction of NOx and SOx mass emissions.
EMP-14	Energy Efficiency	Develop IS 393 energy management system. Investigate and evaluate energy saving opportunities.

The detailed schedule outlining targets for each year of the programme is attached.

3.2 Environmental Management Programme Review 2008

A full review of the Environmental Management Programme for 2008 was prepared and presented to the Management team in January 2009. There were four programmes identified in the original Schedule of Objectives and Targets for the period 2008-2012, active in 2008 and they are summarised in Table 18, below.

Table 18: Environmental Management Programme 2008

Programme No.	Programme Title	Programme Objective
EMP-02	Landfill Reduction	Seek alternative use for Fly and Bottom Ash.
EMP-10	NOx & SOx Emissions to Atmosphere	Reduction in Mass Emissions of NOx & SOx
EMP-11	Emissions to Atmosphere of CO_2 (GHG)	Reduction in Net Emissions of Key Green House Gas CO_2
EMP-14	Energy Efficiency	Minimise in-house energy use & promote efficient use of energy plant wide

A summary review of the status of each programme active in 2008 is attached, detailing the progress made towards achievement of the programme objectives and targets during the course of 2008.

A decision was made to close out Programme number EMP-10; Reduction of NOx and SOx Mass Emissions. EMP-11 is to be modified to accommodate the reduction of NOx and SOx and any remaining objectives from EMP-10.

3.3 Environmental Management Programme Proposal 2009

An Environmental Aspects Register has been compiled as part of the Environmental Management Programme to up-grade the Environmental Management System to meet the requirements of an ISO 14001 system. All aspects of operations at the site have been reviewed and evaluated. Consideration has been given to the environmental impact, the likelihood of occurrence, severity and the possibility to effect change for each aspect considered.

Having reviewed the Environmental Management Programme for 2008 and considered the sites Environmental Aspects Register and the Schedule of Objectives and Targets for the period 2009 - 2013, the detail of the proposed Environmental Management Programme for 2009 has been agreed by the Management team.

3.4 Pollution Emission Register List (PERL)

Having considered operations at the site in conjunction with the Pollution Emission Register List (PERL) detailed in the AER Guidance notes issued by the Agency, the following is considered to be the pollution emission Register List for the site for 2009.

1. Environmental Themes

CO_2
NOx
SOx

3.4.1 PER Tracking 2008

As agreed with the Agency in relation to the PER Tracking during 2008 we continued to monitor total mass of NOx, SOx and CO2 as presented in Table 19 below
A copy of the Electronic PRTR is attached in Appendix 3.

Table 19: PER 2008

Parameter	Kg
SOx	1,923,800
NOx	761,600
CO2	895,057

3.4.2 PER Tracking Proposal 2009

It is proposed to continue to track the following substances from the PERL during 2009; NOx, SOx and CO_2.

4.0 LICENCE SPECIFIC REPORTS

The following licence specific reports were completed in past 12 months and are included in Appendix 3.

- CEMS EN 14181 QAL2 Calibration Report by Protea Ltd
- Assessment of the River Temperature Monitoring Locations. *
- Process Drain Report (Relining Works) **

**Some items were highlighted for attention in these reports; the issues identified will be addressed during the 2009 Maintenance Outage.*
*** Works carried out in light of findings from Drain Survey included in 2007 AER*

5.0 PROPOSALS

It is proposed to carry out the following testing in 2009, as required under the IPPC licence

- Annual noise survey
- PM10 and PM2.5 Analysis
- Temporary Pond Integrity Testing
- Follow up Assessment of the River Temperature Monitoring Locations

6.0 AER SUMMARY DATA TABLE

The new electronic PRTR for 2008 was completed in March 2009 and sent in electronic format to the Agency.
A printed copy has also been included in Appendix 4

7.0 KEY PERFORMANCE INDICATORS SUMMARY

Table 20 below details some performance data for 2008 and compares them with the relevant data for previous years (2004 - 2007), where available.

Table 20: Performance Data Summary

INDICATOR	2008	2007	2006	2005	2004
EMISSIONS					
W-1 Process Effluent Discharge Volume (m^3)	234,021	225,496	222,057	235,560	257,998
SW-1 Settlement Pond Discharge Volume (m^3)	303,267.6	280,947	279,945	291,308	311,319
BOD (Kg)	531.6	549.4	699.2	543.8	631.9
Ammonia-N (Kg)	136.0	143.4	158.2	177.5*	188.7
Total Phosphorus (Kg)	28.9	17.6	13.5	13.0*	13.5
Suspended Solids (Kg)	8919.7	7976.3	7259.4	6673.1*	6,726
Total Dissolved Solids (Kg)	208,394	240,439.1	612,723.0	700,275.7*	801,709.0
Diesel Range organics (Kg)	3.214	7.512	36.589	2.414*	2.638
Petroleum Range Organics (Kg)	2.282	2.263	2.372	2.414*	2.638
Nitrate-N (Kg)	1,773.1	1,424.2	1302.4	1,916.1*	3,193.6
Oils, Fats & Greases (Kg)	1283.7	1,141.5	1134.8	1,739.8*	932.8
Total Kjeldal Nitrogen (Kg)	1,798.8	1,985.6	3,052.7	1,817.9*	2,402.3
Sulphur Dioxide (Kg SOx)	1,923,800	1,675,195.1	1,791,438.1	1,813,162.9	1,863,803.5
Nitrogen Dioxide (Kg NOx)	761,600	607,941	743,517	881,073.6	930,009.7
Particulates (Kg Dust)	89,600	35,752.8	62,150.4	87,652.6	97,970.2
Carbon Dioxide (Kg CO$_2$)	895,057	816,166.07	865,552,130	860,776,000	909,131,640
WASTE					
Total Waste Produced (tonnes)	33,217.23	32,787.4	31,535.5	32,702.03	34,858.866
Waste Disposed of on-site (tonnes)	0	0	0	0	0
Waste Disposed of off-site (tonnes)	33,165.4	32,752.57	31451.93	32,667.352	34,856,588
Waste Recovered on-site (tonnes)	0.49	0.54	15.449	0.676	0.52
Waste Recovered off-site (tonnes)	51.34	34.293	68.148	34.002	1.758
RESOURCE USAGE					
Peat (tonnes)	924,381	827,278	879,336	919,577	973,014
Peat (Energy Tonnes)	1,009,949	993,651	981,995	1,015,668	1,064,106
Medium Fuel Oil (tonnes)	84.037	149.637	217.6	174.7	122.1
Wood Biomass (tonnes)	17,734.0	-	-	-	-
Gas Oil (tonnes)	57.216	88.456	174.3	136.2	119.3
Electricity (MW)	89,685	77,100	80,380.9	81,196	81,985.6
Limestone (tonnes)	4,810.1	4,735	5,281	8,320.83	8,027.0
Sand (tonnes)	1,830.78	1,005	1,157.0	1,422.66	1,514.5
On-site Ground Water (m^3)	25,026.2	24,959.1	32,286.8	35,622.9	39,600
On-site Surface Water (m^3)	1,328,733.5	1,240,593.9	1,289,025.5	1,335,503.3	1,380,404.8
PLANT PERFORMANCE					
Plant Output (MWhrs)	819,684	733,500	771,891	787,781	832,329
Availability (%)	83.16	75.58	79.8	80.9	85.3
Running Days	315.4	304.1	309	321	324
Cycle Efficiency (%)	39.1	38.6	38.8	38.4	39.0
IPPC COMPLIANCE ISSUES					
Complaints	1	2	5	2	4
Section 4/11 Notifications to EPA	0	0	1	3	3

With regard to assessing any of the data detailed in Table 20 in terms of performance, a key element is the conversion of the data into a performance indicator that is related to plant output. Levels of emissions, resource consumption rates and waste produced are directly related to plant output and process efficiency. Assessment of the data is therefore based on the calculation of a performance ratio of the selected parameter against plant output in either MWhrs or GWhrs as applicable. Some Key Environmental Performance Indicators have been selected and are detailed as ratios in Table 19, below.

Table 21: Key Environmental Performance Indicators

INDICATOR	2008	2007	2006	2005	2004
Plant Output (MWhrs)	819,684	733,500	771,891	793,389	832,329
W-1 Process Effluent Discharge Volume (m^3/GWHr)	285.5	307.5	287.7	296.9	309.9
Suspended Solids (Kg/GWhr)	10.88	10.87	9.40	6.61	8.01
Total Dissolved Solids (Kg/GWhr)	254.3	327.8	793.8	873.9	963.2
Oils, Fats & Greases (Kg/GWhr)	1.57	1.56	1.47	1.98	1.12
Sulphur Dioxide (Kg/MWhr)	2.34	2.28	2.32	2.29	2.24
Nitrogen Dioxide (Kg/MWhr)	0.93	0.83	0.96	1.11	1.12
Particulates (Kg/GWhr)	109.3	48.8	80.5	110.5	117.7
Carbon Dioxide (t/MWhr)	1.09	1.11	1.12	1.08	1.09
Total Waste Produced (t/GWhr)	40.52	44.7	40.8	41.2	41.9
Peat (Energy tonnes/MWhr)	1.23	1.35	1.27	1.28	1.28
Electricity Consumed (MW/GWHr)	109.4	105.1	104.1	102.4	98.5
Limestone (t/GWhr)	5.87	6.4	6.8	10.5	9.6
Sand (t/GWhr)	2.23	1.4	1.5	1.8	1.8
Total Water (m^3/MWhr)	1.65	1.72	1.71	1.73	1.71

2008 was an excellent year in terms of production; the excellent availability was achieved even with an extended summer maintenance outage.
Highlights of the Performance Indicator assessment since 2004 include,

Significant decreases in:

- OFG, Total Dissolved & Suspended solids levels in effluent discharge
  - Continued awareness and training in 2008 on spills and cleanups have helped to keep OFG values low in line with the previous year.
- Peat, Limestone & Sand consumption rates
  - Improvement in plant efficiency reducing peat requirements, better control and operation of limestone injection optimising and reducing limestone requirements, and installation & optimisation of new sand reclaim system significantly reducing sand requirements. The new sand silo has been completed towards the end of the year which should significantly reduce the consumption of sand on site as it will allow for bulk storage.
- BOD

  BOD reduced further in 2008 from 2007. This is possibly due to the wet weather particularly during the summer, most likely influencing the incoming water.
- Total Dissolved Solids
  - Optimisation of Demineralisation regeneration process, reducing overall water consumption, the use of the effluent balancing tank.
  - Another factor in the apparent improvement is the new guidance allowing us to take into consideration the TDS concentration of the incoming raw water when calculating our TDS mass emissions. As with many of our parameters, a large percentage of the apparent “effluent emissions” are related to background levels in the Figile River and not related to any materials used or processes on site. Due to the extremely low levels of many of the parameters (many at or below the limit of detection) it was only possible to apply the new process to TDS.

Increases in

- Suspended Solids

  There was a slight increase in suspended solids in 2008. This was investigated to ascertain potential cause. May be necessary to schedule a pond cleaning exercise in 2009.

Comparison of the Performance Indicator assessment in 2008 with the 2007 assessment indicates the following:

- A 22.4% decrease in net TDS discharge levels. This was due to improved control of water treatment plant effluent and an improved analysis regime for identifying incoming raw water TDS values. This value compared to pre 2007 figures shows that raw water intake contributes considerably to our gross TDS value.
- Consolidation of the savings achieved in raw water consumption levels with a 4.1% reduction in 2008.
- A 7.2% decrease in process effluent discharge volumes.
- An 8.9% reduction in peat energy tonne consumption compared to 2007. This is in line with improvements in plant efficiency.
- OFG discharge levels remain steady due primarily to decreased levels of OFG in raw water intake and increased awareness and training of spill management on site
- A 55.3% increase in particulate emissions, partly due to increased running and plant load, but in part due to slightly reduced performance from the Electrostatic Precipitator. The cause has been identified and will be addressed in a scheduled outage in April 2009.
- A 2.3% apparent increase in SOx emissions, due in part to fuel conditions and increased plant availability in 2008
- 9.4% reduction in waste produced in 2008 compared to 2007.

As required under IS EN 14181 and Agency Guidance Note 3, a QAL 2 has been successfully completed in November on our CEMS and the Executive Summary subsection is included in the report. Additional supporting information within the full report is available on site and can be forwarded upon request.

Richard Neale,
Environmental, Health & Safety Manager,
Edenderry Power Ltd.

APPENDIX 1

Protea Report / EN 14181

Protea Report No R1208-1a Part 1 and 2
25th November 2008

QAL2 REPORT

Calibration and Validation of Plant Continuous Emissions Monitoring Systems

Produced for:

Edenderry Power Ltd
Ballykilleen
Edenderry
County Offaly
IRELAND

License Register Number: PO482-02

Prepared by:
Protea Limited
First Avenue
Crewe
CW1 6BG

Tel: 01270 256256
Fax: 01270 214545

Protea
technology leadership
in monitoring solutions

The overall project report has four parts:

- Part 1: QAL2 Report. This is the report on the calibration and validation of the CEM and is for the CEM operator.
- Part 2: QAL2 Executive Summary. This is a one page compliance report to be completed and sent to the Environment Agency by the CEM operator.
- Part 3 and 4: MCERTS Monitoring Report. This report provides monitoring data, methods and accreditation information for the project and lists all supporting information in Part 4. This report is required under MCERTS and is supplied for use by the CEM operator.

All data generated during the project is collated and retained by Protea Ltd. for a minimum of 5 years.

Parts 1 to 4 are supplied both electronically, and as signed hard copies to the customer.

REVISION HISTORY		
Report Number	Description	Issue Date
R1208-1a, Parts 1 and 2	1st issue	25th November 2008

Opinions and interpretations expressed within this report are beyond the scope of Protea's UKAS and MCERTS accreditation.

Report Written by: Gareth Hall QAL2 Analyst MCERTS Registration No. MM 07 792	Signed:

Table of contents

PART 1: QAL2 REPORT

1. INTRODUCTION

1.1 QAL2 Report Overview

This overview of QAL2 is to help the customer understand the process, this report and what they should do next.

Part 1 Section 1 gives a brief outline of the plant and the CEM system

Part 1 Section 2 lists the results of a functionality test.

This is an inspection and some measurements of the CEMs and its components, to ensure that it satisfies the requirements. This is given as an overall summary in the main body of the QAL2 report. A more detailed breakdown of the functional test follows in Appendix 2, with more detailed sections on specific areas. Where there is a problem, this has been highlighted and a corrective action report issued, to help the operator fix the problem. Minor problems need to be fixed promptly but have no other impact. With major problems which are considered may affect the quality of results, the QAL2 testing is normally suspended until they have been fixed.

Part 1 Section 3 presents the results of the parallel testing via SRM (Standard Reference Method) and the calibration and validation of the CEM.

The CEM needs to be able to have a repeatable and accurate performance, with a low variability. This is achieved by carrying out the following steps:

- Tabulating and plotting the CEM and SRM data together
- Calculation of calibration function
- Establish the valid calibration range*
- Convert the data to calibrated and standardised values
- Carry out the test of variability, to establish if the CEM is sufficiently accurate

*One additional problem is that the QAL2 is only valid over the range of parallel measurements and often (as is the case with the majority of determinants) it is not possible to measure higher ranges because the plant will not generate them. In this case, we carry out a linearity test using calibration gases to demonstrate the CEM operates at higher ranges and thereby extend the QAL2 range.

Part 2 is a QAL2 certificate that should be completed by the CEM operator and sent to EA to confirm completion of QAL2. Details have been filled in by Protea as much as possible, but the rest of the certificate is down to the operator – particularly the details of when the QAL2 calibration function has been applied to the CEM.

The remainder of the report (Parts 3 and 4) is required by the MCERTS standards for reference, but is not normally used by the operator.

1.2 Plant Description

Edenderry Power Ltd operates a peat fired condensing power plant at their site in Edenderry. The plant uses approximately 1million tonnes of peat/year to produce energy for a bubbling fluidised bed boiler and a two cylinder gas turbine. Emissions are regulated under license by the EPA, and as part of their license they have to show compliance with BS EN 14181.

Edenderry Powers' ELV's are:

Emission Point	**Target Component**	**Emission Limit Value (as defined in permit)**
		mg/m^3, dry and corrected to 6% Oxygen (daily average)
A1	NOx	325
	SO_2	600
	Dust	50

Figure 1.1 Permitted ELVs

1.3 Description of Plant Continuous Emissions Monitoring Systems (CEMs)

Emissions from the gas turbine are monitored by a CEM system supplied by SICK and ABB.

The gaseous system is a SICK GM31 in-situ Multi Component Analyser set up to measure NO and SO_2. The certified ranges of the GM31 Gas Analyser are:

Component	Certified Range
NO	0 – 130 mg/m^3
SO_2	0 – 75 mg/m^3

Figure 1.2 AMS Measurement ranges

Particulate concentrations are measured by a SICK FW101 Dust Monitor. The certified range of the dust monitor is:

Component	Certified Range
Particulate Concentration	0 – 15 mg/m^3

Figure 1.3 AMS measurement ranges

Oxygen is measured by a ABB ZFG2 Zirconia Oxygen probe with ZDT Oxygen indicator/transmitter, which has a certified range of:

Component	Certified Range
Oxygen	0 – 25% vol

Figure 1.4 AMS measurement ranges

All data from the units is recorded and manipulated by a CBISS data collection system (DCS).

2. FUNCTIONALITY TEST

2.1 Functional Test Report

P1208 **Edenderry Power Station** **FUNCTIONAL TEST REPORT**
Test Date: **17 September 2008**

Activity	Pass or corrective action	Mandatory or Recommended	operator agreeing to correction	agreed date	report on corrective action	completed: sign
em audit						
analysers have QAL1	Pass					
monitoring ranges suitable	Pass					
different fuels/conditions resolved	Pass					
back up systems resolved	Pass					
Sampling System						
to M1 standard	Pass					
sampling probe	Pass					
gas conditioning system	N/A					
pumps & pump flow	N/A					
connections	Pass					
sample lines	N/A					
filters	Pass					
mechanical & electrical build quality	Pass					
general faults	Pass					
Alignmen & Cleanliness (optical systems)						
Measurements						
Leak test	N/A					
zero	Pass					
system span	Pass					
response time	Pass					
CEM linearity	Pass					
Documentation & Records						
A plan of the AMS	Pass					
Manuals, maintenance & user documentation	Pass					
Log books	Pass					
Management system procedures for maintenance & calibration	Pass					
Maintenance schedules	Pass					
Auditing plans & records	Pass					
Service reports	Pass					
Servicea lity & spares						
Safe & clean working environment	Pass					
Easy & safe access to the AMS?	Pass					
Adequate supplies of calibration materials, tools, spares?	Pass					
suitable calibration gases available	Pass					
Facilities to introduce ref materials at inlet of sampling lines?	Not possible on this system					
Facilities to introduce reference materials at inlet of analysers?	Not possible on this system					
	Pass					
QAL3 in ace	Fail	Mandatory	Seamus Burke	17/09/2008	Sick have been tasked to upgrade system to allowautomatic QAL3 checks. This is expected to be completed shortly	
es for Parallel Testing	Pass					

Functional Test by: **Andy Tiffen** MM 05 640

Figure 2.1 Functionality Test

2.2 Linearity Checks

Linearity checks are recommended for QAL2 and a required test for the Annual Surveillance Test (AST). These tests can be used to extend the measurement range of the QAL2 when the plant operation does not permit the generation of higher emissions. Due to the nature of the installation Protea could not carry out a linearity check of the analyser, however Protea oversaw a service done on the AMS by a SICK engineer. The linearity checks shown below are based on results from the SICK service report (detailed in R1208-1a parts 3 and 4), and were done using traceable gases.

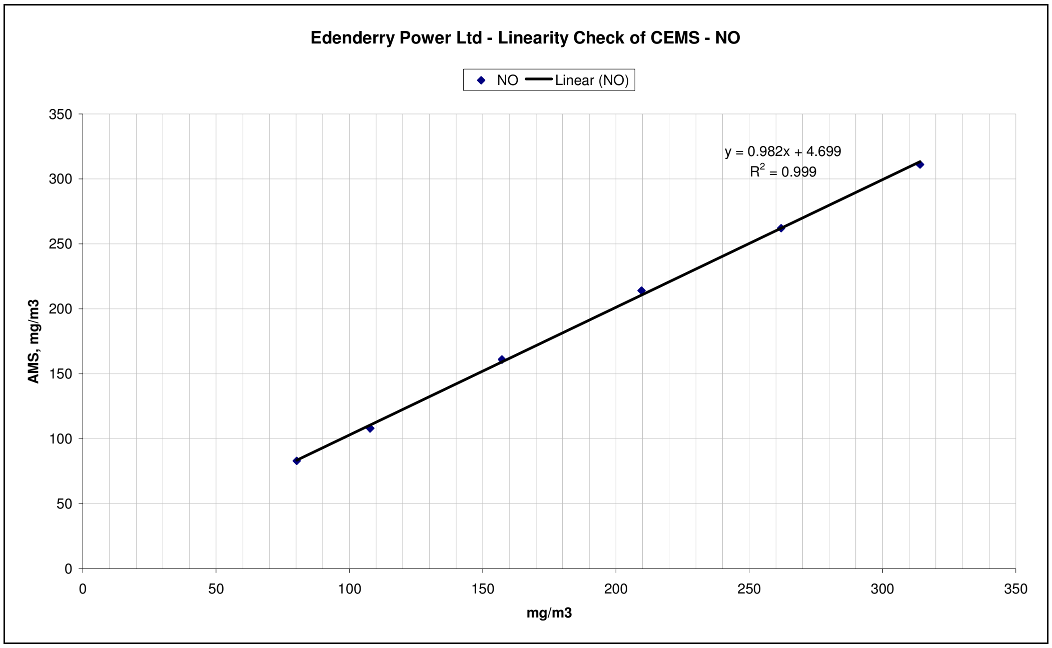


Figure 2.2 Linearity Check of AMS – NO

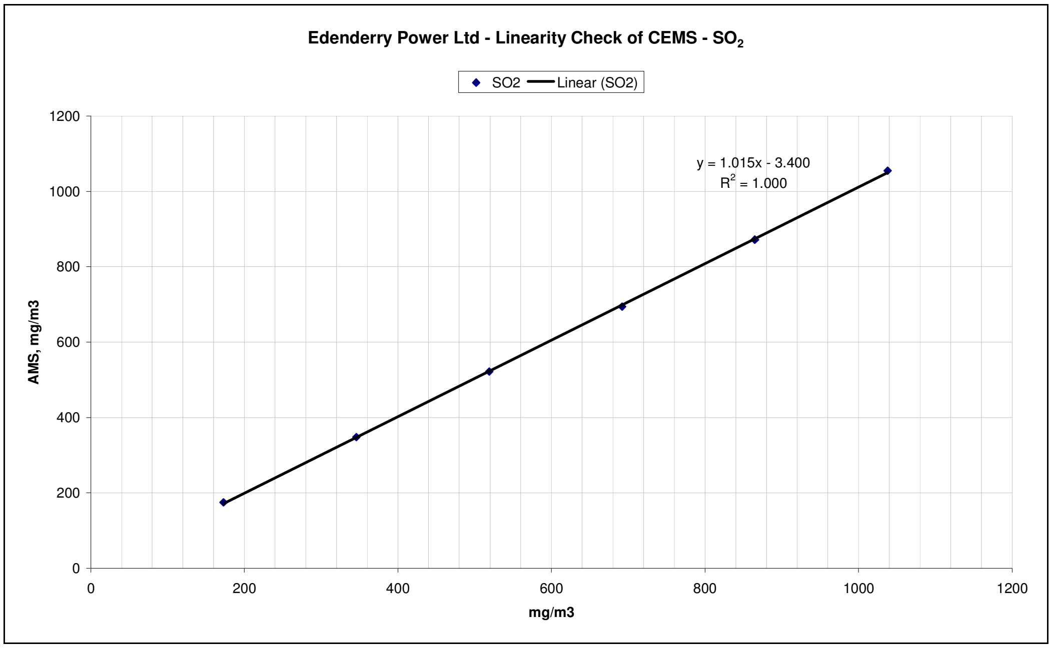


Figure 2.3 Linearity Check of AMS – SO_2

3. CALIBRATION AND VALIDATION OF THE CEMS

This section contains the results of the parallel testing calibration and variability tests carried out between the SRM and the main CEM.

3.1 Application of QAL2 to Edenderry Power's AMS

The major premise for the successful application of BS EN 14181 to calibrate CEMs is that there is a spread of data over the required range of the monitoring system. The certified measuring ranges of the CEMs under test here are detailed in section 1.3.

3.1.1 Zero value measurements

In order to produce an accurate calibration function, the range should extend to as close to zero as possible. The application of QAL2 demands for the addition of measurements at or near zero and, ideally, these zero measurements should be made when the installation is producing zero emissions. A zero measurement is defined as less than 5% of the ELV.

For the Edenderry installation, the zero results must therefore be less than the following limits:

NOx	16.25 mg/m^3
SO_2	30 mg/m^3
Dust	2.5 mg/m^3

In some QAL2 cases, the results do not extend above the zero limits at all and the range needs to be extended to a higher value.

3.1.2 Extension of calibration function

For parallel test measurements it is necessary to have the range cover *at least 50%* of the CEM range. Protea uses this opportunity to extend the CEM calibration range, which is allowed by BS EN 14181.

For the test of each component, 15 or more parallel measurements were made over the monitoring period. These measurements were made when the plant was operating in a period of stability and the resulting measurements do not cover the full range that the CEMs were to be calibrated over. For this reason, the addition of data from the linearity checks of components is used to extend the range where needed. Depending on the amount of extension needed, this has increased the number of individual measurements made and the test parameters have been altered accordingly.

3.2 Summary Calibration Function Results

The following table summarises the results of the QAL2 parallel test. The calibration functions should be applied to the CEM by the operator in order to comply with the standard BS EN 14181. The calibration functions for NOx and SO_2 should be applied after the raw AMS values have been corrected for stack temperature and pressure. The calibration function for particulates should be applied to the raw AMS readings. The component specific calibration functions are shown below:

CEM Analyser Parameter	Calibration Function (where χ is the CEM reading)	Valid Calibration Range, Corrected to Dry and 6% Oxygen	Extended Calibration Range, Corrected to Dry and 6% Oxygen
NO_x	$1.082\chi - 2.780$ mg/m^3	0.0 to 385.3 mg/m^3	0.0 to 482.2 mg/m^3
SO_2	$0.886\chi - 1.944$ mg/m^3	0.0 to 785.2 mg/m^3	0.0 to 865.0 mg/m^3
Particulate	$0.617\chi + 0.003$ mg/m^3	0.0 to 22.0 mg/m^3	--

Figure 3.1 QAL2 Calibration Function Results Summary

The following sections provide details of the analysis for each of the above parameters, together with the data used for the parallel test. The calibration functions determined have also been used on the parallel test data to show how the standard is applied to CEM data. The final part of the analysis is testing the variability of the CEM data. This is detailed for each of the parameters in turn and the result for each shown.

3.3 Calibration and Validation of Analyser

3.3.1 Results for NOx

3.3.1.1 Calibration Function

The calibration function is calculated based on parallel test data from an SRM and the AMS. The test data used is shown in the table below:

Table of Corrected AMS Results - NOx Analysis

Sample #	Date and Time			SRM Measured Value y_i mg/m^3	SRM Corrected Value* y_{is} mg/m^3	AMS Measured Value x_i mg/m^3
Zero Values (<5% ELV)				0.0	0.0	3.7
				0.0	0.0	3.1
				0.0	0.0	3.4
1	21/10/2008 14:45	to	21/10/2008 15:15	284.6	322.2	259.6
2	21/10/2008 15:15	to	21/10/2008 15:45	277.8	316.0	253.2
3	21/10/2008 16:15	to	21/10/2008 16:45	272.5	308.6	252.2
4	21/10/2008 16:45	to	21/10/2008 17:15	274.4	313.4	259.7
5	21/10/2008 17:15	to	21/10/2008 17:45	281.7	324.4	257.0
6	22/10/2008 11:15	to	22/10/2008 11:45	277.4	316.0	247.1
7	22/10/2008 12:15	to	22/10/2008 12:45	268.9	302.1	248.7
8	22/10/2008 13:45	to	22/10/2008 14:15	279.2	321.5	250.6
9	22/10/2008 15:15	to	22/10/2008 15:45	271.2	315.8	250.9
10	22/10/2008 17:15	to	22/10/2008 17:45	270.3	308.5	248.1
11	23/10/2008 11:15	to	23/10/2008 11:45	270.4	311.3	256.5
12	23/10/2008 12:15	to	23/10/2008 12:45	269.6	307.7	262.7
13	23/10/2008 13:15	to	23/10/2008 13:45	276.0	315.5	255.4
14	23/10/2008 14:15	to	23/10/2008 14:45	274.4	315.8	264.2
15	23/10/2008 15:15	to	23/10/2008 15:45	260.4	322.2	266.9

*values at standard conditions (0^oC, 101.3kPa corrected to dry basis and 6% Oxygen)

Figure 3.2 Parallel test data for calculating the calibration function.

The calibration function is described by equation $y_i = a + bx_i$, where;

x_i is the result of the AMS
y_i is the result from the SRM
a is the intercept
b is the slope

BS EN 14181 describes two methods for defining *a* and *b* depending on whether the spread of the SRM data at standard conditions (i.e. $y_{smax} - y_{smin}$) is less than or greater than 15% of the ELV. If the spread of data is greater than 15% then Method A is used, if not then Method B is employed. In this case:

$y_{smax} = 324.4$
$y_{smin} = 0.0$
$y_{smax} - y_{smin} = 324.4$

with 15% of the ELV = 0.15 x 325
= 48.8

Since 324.4>48.8, then Method A is used to calculate the calibration function.

The plot below indicates the parallel test data used to calculate the calibration function:

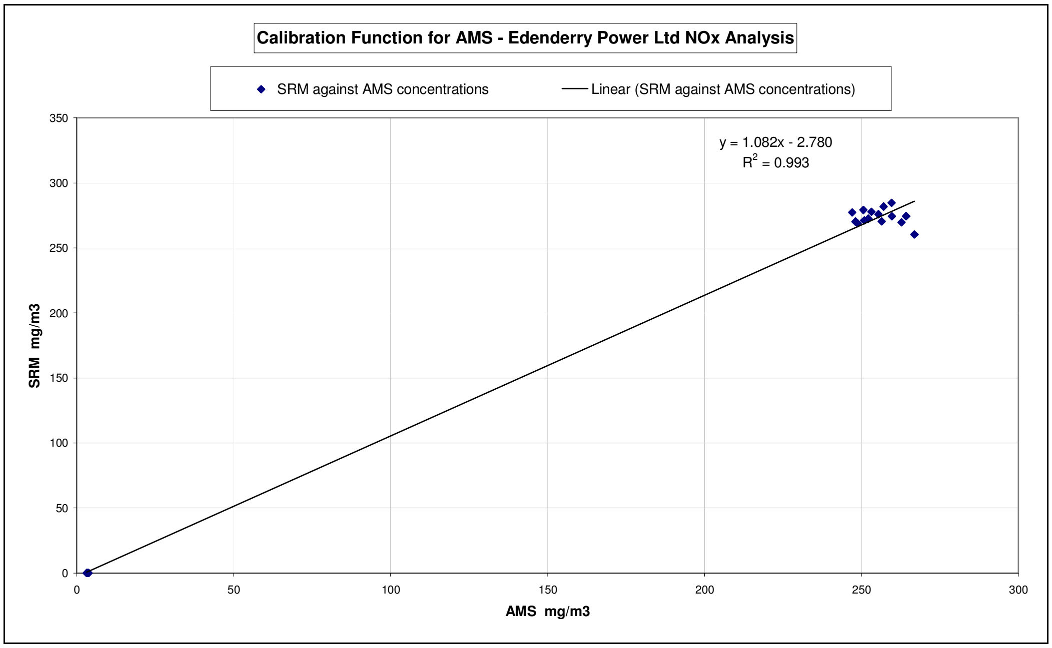


Figure 3.3 Plot of SRM measured values against CEM measured values, with the calibration function determined shown

Using Method A, the calculated calibration function is:

Calibrated Value NOx (mg/m^3) = 1.082 X (CEM reading) – 2.780mg/m^3

3.3.1.2 Calibrated values of the CEM

Once the calibration function has been determined, the data from the CEM can be converted to calibrated values, the calibrated values are shown in the table below:

Sample #	Date and Time	SRM Corrected Value* y_s mg/m^3	AMS Measured Value x_i mg/m^3	AMS Calibrated Value $\hat{y}_i$ mg/m^3	AMS Oxygen %	AMS Water %	AMS Calibrated Value* $\hat{y}_{i,s}$ mg/m^3
Zero Values (<5% ELV)		0.0	3.7	1.3	--	--	1.3
		0.0	3.1	0.6	--	--	0.6
		0.0	3.4	0.9	--	--	0.9
1	21/10/2008 14:45 to 21/10/2008 15:15	322.2	259.6	278.2	4.8	24.2	339.9
2	21/10/2008 15:15 to 21/10/2008 15:45	316.0	253.2	271.2	4.7	24.3	329.3
3	21/10/2008 16:15 to 21/10/2008 16:45	308.6	252.2	270.2	4.6	24.3	326.7
4	21/10/2008 16:45 to 21/10/2008 17:15	313.4	259.7	278.3	4.8	24.4	339.9
5	21/10/2008 17:15 to 21/10/2008 17:45	324.4	257.0	275.4	4.7	24.7	336.7
6	22/10/2008 11:15 to 22/10/2008 11:45	316.0	247.1	264.6	4.7	24.6	322.9
7	22/10/2008 12:15 to 22/10/2008 12:45	302.1	248.7	266.4	4.6	24.5	323.0
8	22/10/2008 13:45 to 22/10/2008 14:15	321.5	250.6	268.4	4.7	25.0	328.2
9	22/10/2008 15:15 to 22/10/2008 15:45	315.8	250.9	268.7	4.7	25.4	331.1
10	22/10/2008 17:15 to 22/10/2008 17:45	308.5	248.1	265.7	4.7	25.0	324.9
11	23/10/2008 11:15 to 23/10/2008 11:45	311.3	256.5	274.7	4.6	24.7	334.2
12	23/10/2008 12:15 to 23/10/2008 12:45	307.7	262.7	281.6	4.8	24.4	343.6
13	23/10/2008 13:15 to 23/10/2008 13:45	315.5	255.4	273.6	4.7	24.8	333.4
14	23/10/2008 14:15 to 23/10/2008 14:45	315.8	264.2	283.2	4.8	24.2	346.1
15	23/10/2008 15:15 to 23/10/2008 15:45	322.2	266.9	286.1	4.8	24.6	350.3

*values at standard conditions (0°C, 101.3kPa, corrected to dry basis and 6% Oxygen)

Figure 3. Application of calibration function to AMS measured values

3.3.1.3 Valid Calibration Range and Range Extension

The calibration function is valid when the plant is operated within the valid calibration range. This is defined as being from zero to $\hat{y}_{s,max}$ (maximum AMS calibrated value) plus an extension of 10%. For the calibration function determined above, this valid range is:

0.0 mg/m3 < Corrected value NOx < 385.3 mg/m3

Figure 3. Valid calibration range

The range over which the calibration function is valid can be extended up to two times the ELV using appropriate reference material provided that the data points lie within 95% confidence intervals of the data set. Linearity data was recorded on site by a SICK technician and has been used to increase the valid range of the calibration function. This shown in the chart below:

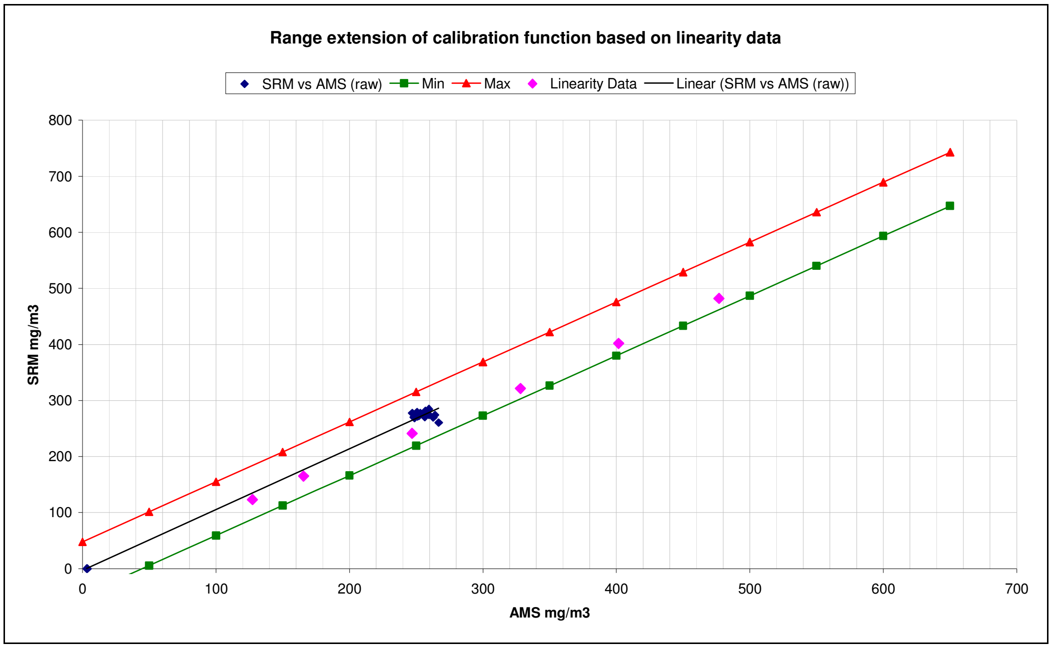


Figure 3. Extension of valid range using Linearity data

The chart above shows that the linearity data points lie within 95% confidence intervals of the calibration function and as such the valid range of the calibration function has been extended. The valid range is now:

0.0 mg/m3 < Corrected value NOx < 482.2 mg/m3

Figure 3. Extended range

3.3.1.4 Test of Variability

The variability is accepted if $s_D \leq \sigma_0 k_v$ where,

s_D is the standard deviation of the differences of the SRM and the calibrated CEM measurements. It is given by the formula,

$$\boxed{s_D = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(D_i - \overline{D})^2}}$$

Figure 3.4 Standard deviation of measurements

σ_0 is the uncertainty, calculated from 20% of the ELV at 95% confidence level divided by 1.96. Edenderry Power's ELV is 325mg/m^3. This is equal to 33.16mg/m^3 for the NOx emissions of this test.

k_v is the test parameter. For a 18 measurement test, this is 0.9803.

The calculated results of the variability test are as follows.

s_D = 10.33 mg/m^3

$\sigma_0 k_v$ = 32.51 mg/m^3

Variability Pass Criteria $s_D \leq \sigma_0 k_v$
10.33 < 32.51
CEM HAS PASSED VARIABILITY TEST

Figure 3.5 Result of variability test

3.3.2 Results for SO_2

3.3.2.1 Calibration Function

The calibration function is calculated based on parallel test data from an SRM and the AMS. The test data used is shown in the table below:

Table of Corrected AMS Results - SO_2 Analysis

Sample #	Date and Time			SRM Measured Value y_i mg/m^3	SRM Corrected Value* y_{is} mg/m^3	AMS Measured Value x_i mg/m^3
Zero Values (<5% ELV)				0.0	0.0	3.2
				0.0	0.0	2.0
				0.0	0.0	3.2
1	21/10/2008 14:45	to	21/10/2008 15:15	543.6	615.3	625.5
2	21/10/2008 15:15	to	21/10/2008 15:45	553.3	629.1	632.0
3	21/10/2008 16:15	to	21/10/2008 16:45	573.2	648.9	661.3
4	21/10/2008 16:45	to	21/10/2008 17:15	578.8	660.9	661.8
5	21/10/2008 17:15	to	21/10/2008 17:45	574.6	661.4	653.8
6	22/10/2008 11:15	to	22/10/2008 11:45	427.4	486.6	495.5
7	22/10/2008 12:15	to	22/10/2008 12:45	564.8	634.3	624.2
8	22/10/2008 13:45	to	22/10/2008 14:15	549.1	632.1	609.8
9	22/10/2008 15:15	to	22/10/2008 15:45	548.3	638.0	597.2
10	22/10/2008 17:15	to	22/10/2008 17:45	504.9	575.9	555.0
11	23/10/2008 11:15	to	23/10/2008 11:45	498.5	573.7	583.8
12	23/10/2008 12:15	to	23/10/2008 12:45	510.4	582.3	591.5
13	23/10/2008 13:15	to	23/10/2008 13:45	519.0	593.3	566.2
14	23/10/2008 14:15	to	23/10/2008 14:45	519.7	597.9	577.6
15	23/10/2008 15:15	to	23/10/2008 15:45	491.7	607.7	575.9

*values at standard conditions (0°C, 101.3kPa corrected to dry basis and 6% Oxygen)

Figure 3.6 Parallel test data for calculating the calibration function.

The calibration function is described by equation $y_i = a + bx_i$, where;

x_i is the result of the AMS
y_i is the result from the SRM
a is the intercept
b is the slope

BS EN 14181 describes two methods for defining a and b depending on whether the spread of the SRM data at standard conditions (i.e. $y_{smax} - y_{smin}$) is less than or greater than 15% of the ELV. If the spread of data is greater than 15% then Method A is used, if not then Method B is employed. In this case:

$y_{smax} = 661.4$
$y_{smin} = 0$
$y_{smax} - y_{smin} = 661.4$

with 15% of the ELV $= 0.15 \times 600$
$= 90$

Since 661.4>90, then Method A is used to calculate the calibration function.

The plot below indicates the parallel test data and linearity data used to calculate the calibration function:

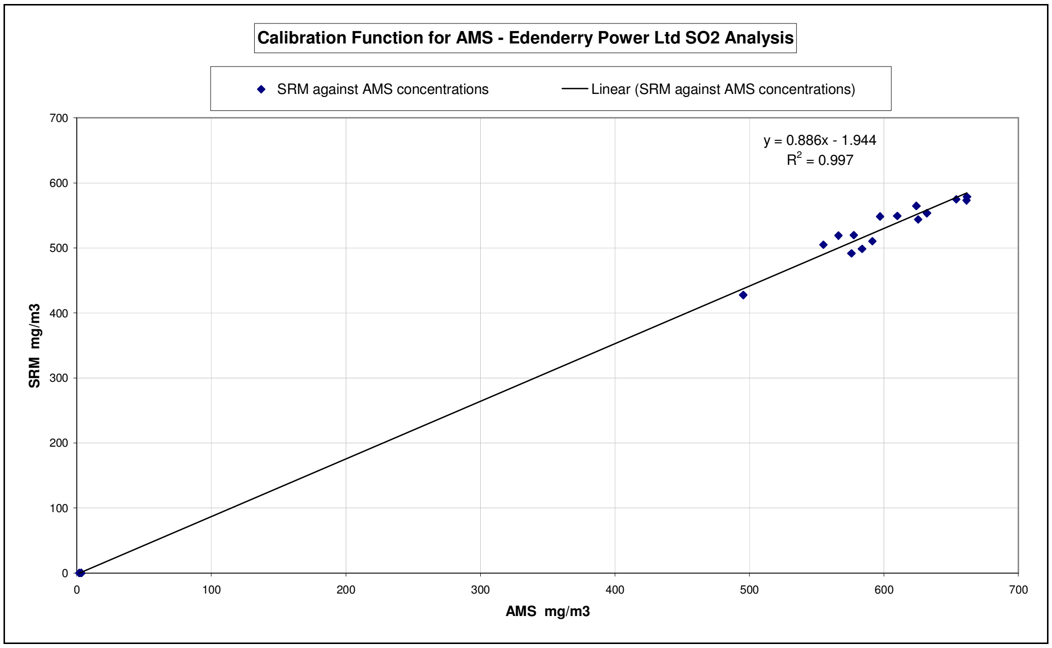


Figure 3.7 Plot of SRM measured values against CEM measured values, with the calibration function determined shown

Using Method A, the calculated calibration function is:

Calibrated Value SO_2 (mg/m^3) = 0.886 X (CEM reading) – 1.944 mg/m^3

3.3.2.2 Calibrated Values of the CEM

Once the calibration function has been determined, the data from the CEM can be converted to calibrated values, the calibrated values are shown in the table below:

Sample #	Date and Time			SRM Corrected Value* y_s mg/m^3	AMS Measured Value x_i mg/m^3	AMS Calibrated Value $\hat{y}_i$ mg/m^3	AMS Oxygen %	AMS Water %	AMS Calibrated Value* $\hat{y}_{i,s}$ mg/m^3
Zero Values (<5% ELV)				0.0	3.2	0.9	--	--	0.9
				0.0	2.0	-0.2	--	--	-0.2
				0.0	3.2	0.8	--	--	0.8
1	21/10/2008 14:45	to	21/10/2008 15:15	615.3	625.5	552.3	4.8	24.2	675.0
2	21/10/2008 15:15	to	21/10/2008 15:45	629.1	632.0	558.1	4.7	24.3	677.6
3	21/10/2008 16:15	to	21/10/2008 16:45	648.9	661.3	584.1	4.6	24.3	706.3
4	21/10/2008 16:45	to	21/10/2008 17:15	660.9	661.8	584.5	4.8	24.4	713.8
5	21/10/2008 17:15	to	21/10/2008 17:45	661.4	653.8	577.4	4.7	24.7	705.9
6	22/10/2008 11:15	to	22/10/2008 11:45	486.6	495.5	437.1	4.7	24.6	533.5
7	22/10/2008 12:15	to	22/10/2008 12:45	634.3	624.2	551.2	4.6	24.5	668.2
8	22/10/2008 13:45	to	22/10/2008 14:15	632.1	609.8	538.5	4.7	25.0	658.4
9	22/10/2008 15:15	to	22/10/2008 15:45	638.0	597.2	527.3	4.7	25.4	649.7
10	22/10/2008 17:15	to	22/10/2008 17:45	575.9	555.0	489.8	4.7	25.0	598.9
11	23/10/2008 11:15	to	23/10/2008 11:45	573.7	583.8	515.3	4.6	24.7	626.9
12	23/10/2008 12:15	to	23/10/2008 12:45	582.3	591.5	522.2	4.8	24.4	637.2
13	23/10/2008 13:15	to	23/10/2008 13:45	593.3	566.2	499.8	4.7	24.8	609.0
14	23/10/2008 14:15	to	23/10/2008 14:45	597.9	577.6	509.9	4.8	24.2	623.1
15	23/10/2008 15:15	to	23/10/2008 15:45	607.7	575.9	508.4	4.8	24.6	622.5
*values at standard conditions (0°C, 101.3kPa corrected to dry basis and 6% Oxygen)									

Figure 3. Application of calibration function to AMS measured values

3.3.2.3 Valid Calibration Range and Range Extension

The calibration function is valid when the plant is operated within the valid calibration range. This is defined as being from zero to $\hat{y}_{s,max}$ (maximum AMS calibrated value) plus an extension of 10%. For the calibration function determined above, this valid range is:

0.0 mg/m3 < Corrected value SO2 < 785.2 mg/m3

Figure 3. Valid calibration range

The range over which the calibration function is valid can be extended up to two times the ELV using appropriate reference material provided that the data points lie within 95% confidence intervals of the data set. Linearity data was recorded on site by a SICK technician and has been used to increase the valid range of the calibration function. This shown in the chart below:

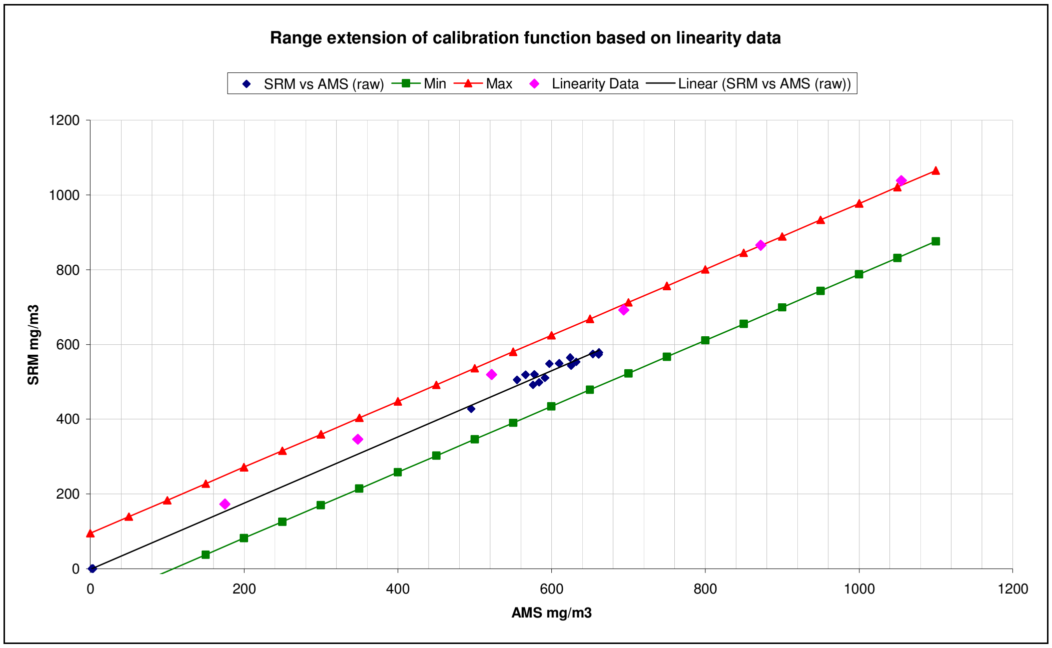


Figure 3. Extension of valid range using Linearity data

The chart above shows that the linearity data points lie within 95% confidence intervals of the calibration function and as such the valid range of the calibration function has been extended. The valid range is now:

0.0 mg/m3 < Corrected value SO_2 < 865.0 mg/m3

Figure 3. Extended range

3.3.2.4 Test of Variability

The variability is accepted if $s_D \leq \sigma_0 k_v$ where,

s_D is the standard deviation of the differences of the SRM and the calibrated CEM measurements. It is given by the formula,

$$\boxed{s_D = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(D_i - \overline{D})^2}}$$

Figure 3.8 Standard deviation of measurements

σ_0 is the uncertainty, calculated from 20% of the ELV at 95% confidence level divided by 1.96. Edenderry Power's ELV is 600 mg/m^3. This is equal to 61.22mg/m^3 for the SO2 emissions of this test.

k_v is the test parameter. For a 18 measurement test, this is 0.9803.

The calculated results of the variability test are as follows.

s_D = 21.11 mg/m^3

$\sigma_0 k_v$ = 60.02 mg/m^3

Variability Pass Criteria $s_D \leq \sigma_0 k_v$
21.11 < 60.02
CEM HAS PASSED VARIABILITY TEST

Figure 3.9 Result of variability test

3.3.3 Results for Particulates

3.3.3.1 Calibration Function

The calibration function is calculated based on parallel test data from an SRM and the AMS. The test data used is shown in the table below:

Table of Corrected AMS Results - Particulate Analysis

Sample #	Date and Time			SRM Measured Value y_i mg/m^3	SRM Corrected Value* y_{is} mg/m^3	AMS Measured Value x_i mg/m^3
Zero Values (<5% ELV)				0.0	0.0	0.2
				0.0	0.0	-0.2
				0.0	0.0	0.3
1	21/10/2008 14:40	to	21/10/2008 15:40	9.5	11.3	15.9
2	21/10/2008 16:10	to	21/10/2008 17:10	9.1	10.8	15.0
3	21/10/2008 17:30	to	21/10/2008 18:30	8.8	10.6	16.6
4	22/10/2008 10:40	to	22/10/2008 11:40	9.2	10.8	14.4
5	22/10/2008 11:50	to	22/10/2008 12:50	6.7	7.9	13.6
6	22/10/2008 13:10	to	22/10/2008 14:10	10.1	11.9	15.1
7	22/10/2008 14:20	to	22/10/2008 15:20	9.0	10.7	16.5
8	22/10/2008 15:30	to	22/10/2008 16:30	9.4	11.2	15.8
9	22/10/2008 17:00	to	22/10/2008 18:00	7.7	9.1	10.2
10	24/10/2008 09:30	to	24/10/2008 10:30	11.9	14.2	17.0
11	24/10/2008 10:45	to	24/10/2008 11:45	12.0	14.3	16.1
12	27/10/2008 14:30	to	27/10/2008 15:30	10.0	11.7	17.1
13	27/10/2008 16:00	to	27/10/2008 17:00	14.6	17.1	19.3
14	28/10/2008 10:00	to	28/10/2008 11:00	9.8	11.1	16.0
15	28/10/2008 11:35	to	28/10/2008 12:35	15.1	17.7	26.3
16	28/10/2008 13:50	to	28/10/2008 14:50	6.3	7.4	13.3

*values at standard conditions (0°C, 101.3kPa, corrected to dry basis and 6% Oxygen)

Figure 3.10 Parallel test data for calculating the calibration function.

The calibration function is described by equation $y_i = a + bx_i$, where;

x_i is the result of the AMS
y_i is the result from the SRM
a is the intercept
b is the slope

BS EN 14181 describes two methods for defining a and b depending on whether the spread of the SRM data at standard conditions (i.e. $y_{smax} - y_{smin}$) is less than or greater than 15% of the ELV. If the spread of data is greater than 15% then Method A is used, if not then Method B is employed. In this case:

$y_{smax} = 17.7$
$y_{smin} = 0$
$y_{smax} - y_{smin} = 17.7$

with 15% of the ELV = 0.15 x 90
= 7.5

Since 17.7>7.5, then Method A is used to calculate the calibration function.

The plot below indicates the parallel test data and linearity data used to calculate the calibration function:

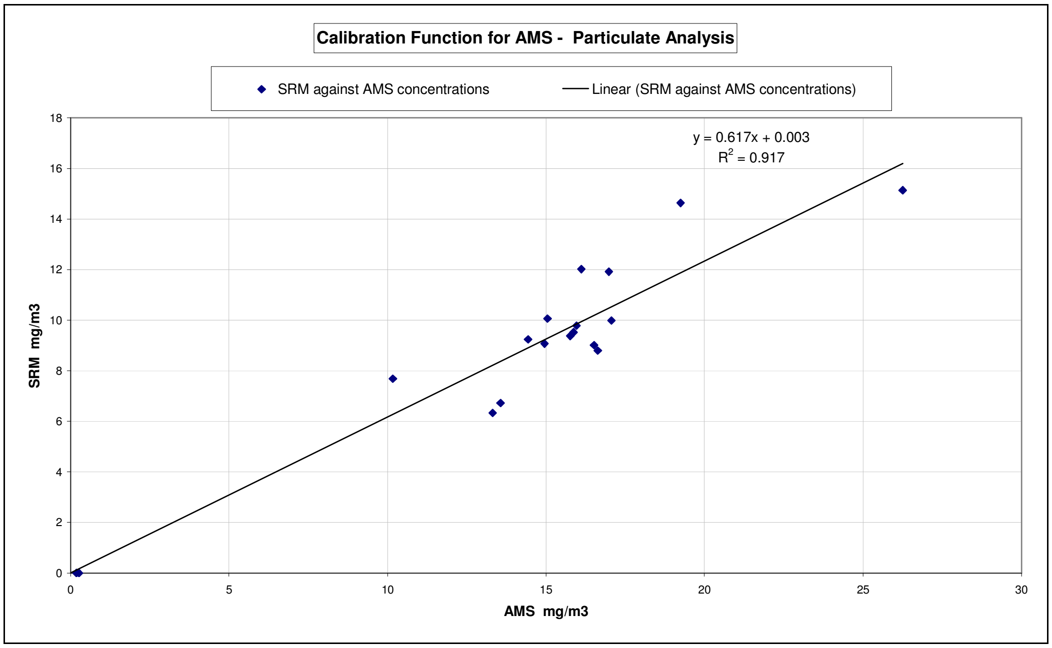


Figure 3.11 Plot of SRM measured values against CEM measured values, with the calibration function determined shown

Using Method A, the calculated calibration function is:

Calibrated Value Particulates (mg/m^3) = 0.617 X (CEM reading) + 0.003 mg/m^3

3.3.3.2 Calibrated Values of the CEM

Once the calibration function has been determined, the data from the CEM can be converted to calibrated values, the calibrated values are shown in the table below:

Sample #	Date and Time	SRM Corrected Value* y_s mg/m^3	AMS Measured Value x_i mg/m^3	AMS Calibrated Value $\hat{y}_i$ mg/m^3	AMS Oxygen %	AMS Water %	AMS Calibrated Value* $\hat{y}_{i,s}$ mg/m^3
Zero Values (<5% ELV)		0.0	0.2	0.1	--	--	0.1
		0.0	-0.2	-0.1	--	--	-0.1
		0.0	0.3	0.2	--	--	0.2
1	21/10/2008 14:40 to 21/10/2008 15:40	11.3	15.9	9.8	4.8	24.3	11.9
2	21/10/2008 16:10 to 21/10/2008 17:10	10.8	15.0	9.2	4.7	24.3	11.2
3	21/10/2008 17:30 to 21/10/2008 18:30	10.6	16.6	10.3	4.7	24.7	12.5
4	22/10/2008 10:40 to 22/10/2008 11:40	10.8	14.4	8.9	4.8	24.7	10.9
5	22/10/2008 11:50 to 22/10/2008 12:50	7.9	13.6	8.4	4.6	24.5	10.1
6	22/10/2008 13:10 to 22/10/2008 14:10	11.9	15.1	9.3	4.8	24.7	11.4
7	22/10/2008 14:20 to 22/10/2008 15:20	10.7	16.5	10.2	4.6	25.2	12.5
8	22/10/2008 15:30 to 22/10/2008 16:30	11.2	15.8	9.7	4.8	25.3	12.0
9	22/10/2008 17:00 to 22/10/2008 18:00	9.1	10.2	6.3	4.7	25.0	7.7
10	24/10/2008 09:30 to 24/10/2008 10:30	14.2	17.0	10.5	4.6	24.9	12.8
11	24/10/2008 10:45 to 24/10/2008 11:45	14.3	16.1	9.9	4.7	24.4	12.1
12	27/10/2008 14:30 to 27/10/2008 15:30	11.7	17.1	10.5	4.7	25.1	13.0
13	27/10/2008 16:00 to 27/10/2008 17:00	17.1	19.3	11.9	4.9	25.0	14.7
14	28/10/2008 10:00 to 28/10/2008 11:00	11.1	16.0	9.9	4.8	24.9	12.1
15	28/10/2008 11:35 to 28/10/2008 12:35	17.7	26.3	16.2	4.9	24.7	20.0
16	28/10/2008 13:50 to 28/10/2008 14:50	7.4	13.3	8.2	4.8	24.8	10.1
*values at standard conditions (0°C, 101.3kPa, corrected to dry basis and 6% Oxygen)							

Figure 3. Application of calibration function to AMS measured values

3.3.3.3 Valid Calibration Range and Range Extension

The calibration function is valid when the plant is operated within the valid calibration range. This is defined as being from zero to $\hat{y}_{s,max}$ (maximum AMS calibrated value) plus an extension of 10%. For the calibration function determined above, this valid range is:

0.0 mg/m3 < Corrected value Particulate < 22.0 mg/m3

Figure 3. Valid calibration range

3.3.3.4 Test of Variability

The variability is accepted if $s_D \leq \sigma_0 k_v$ where,

s_D is the standard deviation of the differences of the SRM and the calibrated CEM measurements. It is given by the formula,

$$\boxed{s_D = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(D_i - \overline{D})^2}}$$

Figure 3.12 Standard deviation of measurements

σ_0 is the uncertainty, calculated from 30% of the ELV at 95% confidence level divided by 1.96. Edenderry Power's ELV is 50 mg/m^3. This is equal to 7.65mg/m^3 for the particulate emissions of this test.

k_v is the test parameter. For a 18 measurement test, this is 0.9803.

The calculated results of the variability test are as follows.

s_D = 1.50 mg/m^3

$\sigma_0 k_v$ = 7.51 mg/m^3

Variability Pass Criteria $s_D \leq \sigma_0 k_v$
1.50 < 7.51
CEM HAS PASSED VARIABILITY TEST

Figure 3.13 Result of variability test

3.3.4 Results for Oxygen

The calibration function, valid range and test of variability shown below for oxygen are included for information purposes only to show that the SRM and AMS are reading comparable results. The calibration function should not be used to correct oxygen results within the AMS or DCS. Due to the type of installation and plant operations it was not possible to check the CEMS response for when oxygen levels drop below 5% of the ELV (virtual ELV for oxygen is 20.9%). Instead ambient span results have been used to increase the range of the calibration function and carry out a test of variability.

3.3.4.1 Calibration Function

The calibration function is calculated based on parallel test data from an SRM and the AMS. The test data used is shown in the table below:

Table of Corrected AMS Results - Oxygen Analysis

Sample #	Date and Time			SRM Measured Value y_i %	SRM Corrected Value* y_{is} %	AMS Measured Value x_i %
Air span results (not possible to test CEMS for zero response to oxygen)				20.9	20.9	20.7
				20.9	20.9	20.7
				20.9	20.9	20.7
1	21/10/2008 14:45	to	21/10/2008 15:15	4.0	4.8	3.7
2	21/10/2008 15:15	to	21/10/2008 15:45	3.9	4.8	3.6
3	21/10/2008 16:15	to	21/10/2008 16:45	3.8	4.7	3.5
4	21/10/2008 16:45	to	21/10/2008 17:15	3.9	4.8	3.6
5	21/10/2008 17:15	to	21/10/2008 17:45	3.9	4.9	3.6
6	22/10/2008 11:15	to	22/10/2008 11:45	3.9	4.8	3.6
7	22/10/2008 12:15	to	22/10/2008 12:45	3.7	4.6	3.5
8	22/10/2008 13:45	to	22/10/2008 14:15	3.8	4.7	3.5
9	22/10/2008 15:15	to	22/10/2008 15:45	3.7	4.7	3.5
10	22/10/2008 17:15	to	22/10/2008 17:45	3.8	4.7	3.5
11	23/10/2008 11:15	to	23/10/2008 11:45	3.7	4.6	3.5
12	23/10/2008 12:15	to	23/10/2008 12:45	3.7	4.6	3.6
13	23/10/2008 13:15	to	23/10/2008 13:45	3.7	4.7	3.5
14	23/10/2008 14:15	to	23/10/2008 14:45	3.8	4.7	3.7
15	23/10/2008 15:15	to	23/10/2008 15:45	3.5	4.7	3.6

*values at standard conditions (0^{o}C, 101.3kPa, corrected to dry basis)

Figure 3.14 Parallel test data for calculating the calibration function.

The calibration function is described by equation $y_i = a + bx_i$, where;

x_i is the result of the AMS
y_i is the result from the SRM
a is the intercept
b is the slope

BS EN 14181 describes two methods for defining a and b depending on whether the spread of the SRM data at standard conditions (i.e. $y_{smax} - y_{smin}$) is less than or greater than 15% of the ELV. If the spread of data is greater than 15% then Method A is used, if not then Method B is employed.

In this case:

$$y_{smax} = 20.9$$
$$y_{smin} = 4.6$$
$$y_{smax} - y_{smin} = 16.3$$

with 15% of the ELV = 0.15 x 21
= 3.15

Since 16.3 > 3.15, then Method A is used to calculate the calibration function.

The plot below indicates the parallel test data used to calculate the calibration function:

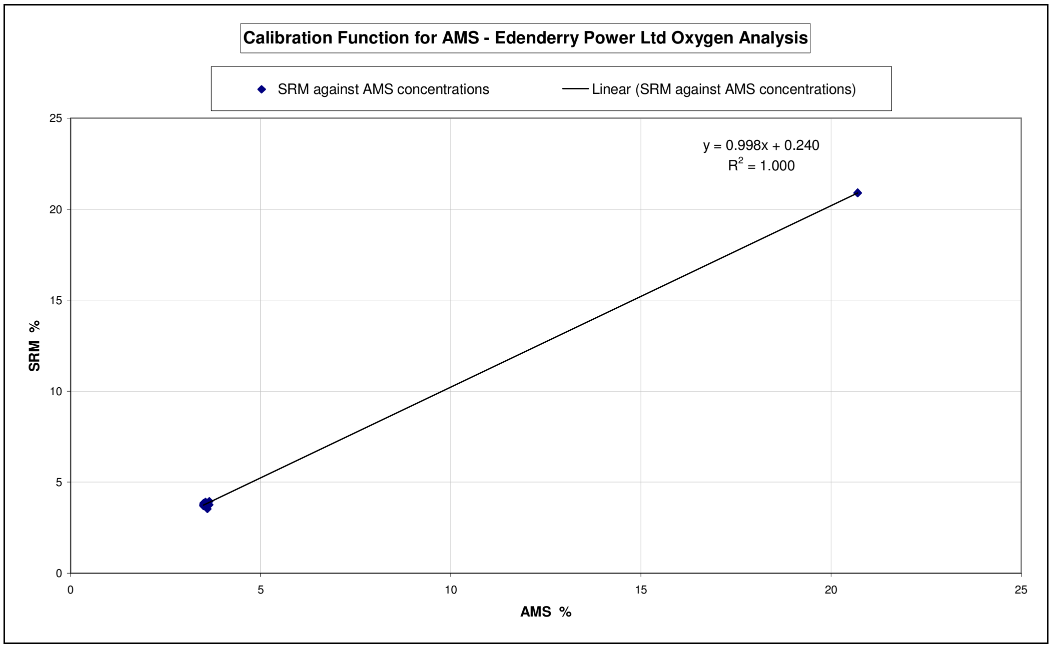


Figure 3.15 Plot of SRM measured values against CEM measured values, with the calibration function determined shown

Using Method A, the calculated calibration function is:

Calibrated Value Oxygen (%) = 0.996 X (CEM reading) + 0.240 %

3.3.4.2 Calibrated Values of the CEM

Once the calibration function has been determined, the data from the CEM can be converted to calibrated values, the calibrated values are shown in the table below:

Sample #	Date and Time			SRM Corrected Value* y_s %	AMS Measured Value x_i %	AMS Calibrated Value $\hat{y}_i$ %	AMS Water %	AMS Calibrated Value* $\hat{y}_{i,s}$ %
Air span results (not possible to test CEMS for zero response to oxygen)				20.9	20.7	20.9	--	20.9
				20.9	20.7	20.9	--	20.9
				20.9	20.7	20.9	--	20.9
1	21/10/2008 14:45	to	21/10/2008 15:15	4.8	3.7	3.9	24.2	5.1
2	21/10/2008 15:15	to	21/10/2008 15:45	4.8	3.6	3.8	24.3	5.0
3	21/10/2008 16:15	to	21/10/2008 16:45	4.7	3.5	3.7	24.3	4.9
4	21/10/2008 16:45	to	21/10/2008 17:15	4.8	3.6	3.8	24.4	5.1
5	21/10/2008 17:15	to	21/10/2008 17:45	4.9	3.6	3.8	24.7	5.0
6	22/10/2008 11:15	to	22/10/2008 11:45	4.8	3.6	3.8	24.6	5.0
7	22/10/2008 12:15	to	22/10/2008 12:45	4.6	3.5	3.7	24.5	4.9
8	22/10/2008 13:45	to	22/10/2008 14:15	4.7	3.5	3.7	25.0	5.0
9	22/10/2008 15:15	to	22/10/2008 15:45	4.7	3.5	3.7	25.4	5.0
10	22/10/2008 17:15	to	22/10/2008 17:45	4.7	3.5	3.7	25.0	5.0
11	23/10/2008 11:15	to	23/10/2008 11:45	4.6	3.5	3.7	24.7	5.0
12	23/10/2008 12:15	to	23/10/2008 12:45	4.6	3.6	3.8	24.4	5.1
13	23/10/2008 13:15	to	23/10/2008 13:45	4.7	3.5	3.7	24.8	5.0
14	23/10/2008 14:15	to	23/10/2008 14:45	4.7	3.7	3.9	24.2	5.1
15	23/10/2008 15:15	to	23/10/2008 15:45	4.7	3.6	3.8	24.6	5.1
*values at standard conditions (0^{o}C, 101.3kPa corrected to dry basis)								

Figure 3. Application of calibration function to AMS measured values

3.3.4.3 Valid Calibration Range and Range Extension

The calibration function is valid when the plant is operated within the valid calibration range. This is normally defined as being from zero to $\hat{y}_{s,max}$ (maximum AMS calibrated value) plus an extension of 10%. For the calibration function determined above, this valid range is:

0.0 % < Corrected value Oxygen < 23.0 %

Figure 3. Valid calibration range

3.3.4.4 Test of Variability

The variability is accepted if $s_D \leq \sigma_0 k_v$ where,

s_D is the standard deviation of the differences of the SRM and the calibrated CEM measurements. It is given by the formula,

$$s_D = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(D_i - \overline{D})^2}$$

Figure 3.16 Standard deviation of measurements

σ_0 is the uncertainty, calculated from 10% of the ELV at 95% confidence level divided by 1.96. Roche Ireland's ELV is 21%. This is equal to 1.07% for the oxygen emissions of this test.

k_v is the test parameter. For a 18 measurement test, this is 0.9803.

The calculated results of the variability test are as follows.

$$s_D = 0.13\ \%$$

$$\sigma_0 k_v = 1.05\ \%$$

Variability Pass Criteria $s_D \leq \sigma_0 k_v$
0.13 < 1.05
CEM HAS PASSED VARIABILITY TEST

Figure 3.17 Result of variability test

3.4 Description of Standard Reference Methods used (SRM)

3.4.1 Gas Analysis via FTIR

This project was carried out using a Protir 204M FTIR analyser. The FT-IR spectrometer is a modern multi-component analyser. It has the ability with suitable calibration and software, to measure the concentration of a wide range of organic and inorganic components in gas emissions. The analyser has a measurement cell and sample path fully heated to 180℃ to prevent any sample condensation and subsequent loss of emission. The sample line used to transport sample from stack to analyser is also heated to 180℃.

The 204M FT-IR measures all components simultaneously and calculates concentrations on-line. The measuring range of each component is adjustable by software changes to any value between the minimum and maximum ranges shown below.

Component	Minimum Range	Maximum Range
SO_2	0 - 30 ppm (85mg/m^3)	0 - 2000 ppm (6000mg/m^3)
NO	0 - 50 ppm (110mg/m^3)	0 - 1500 ppm (1800mg/m^3)
NO_2	0 - 30 ppm (60mg/m^3)	0 - 500 ppm (1000mg/m^3)
H_2O	0 - 1 VOL %	0 - 30 VOL %

Figure 3.18 Measurement Ranges and Detection Limits of FTIR CEMAS analyser

204M FTIR Analyser Performance:

Limit of detection:	< 2% of minimum range
Interference:	< 4% of minimum range
Zero Drift:	< 2% of minimum range/Day
Calibration Drift:	< 2% of minimum range (FS)/Day
Linearity:	< 2% of measuring range (FS)

Monitoring of oxygen was done to the BS EN 14789 standard, using a paramagnetic servomex oxygen meter which has an operating range of 0% - 25%.

Protea used the standard method ASTM D6348-03 for FTIR monitoring of NOx and SO_2. Oxygen was monitored to BS EN 14789. Protea is accredited under MCERTS for this method as well as many other forms of monitoring and full details are provided in part 3 of this report.

The ASTM method is a high level validation procedure, involving extensive in stack calibration. This method gives a high level of confidence in the results.

Measurement uncertainties are calculated and reported in the MCERTS monitoring part 3 of this report.

3.4.2 Particulate Analysis via to BS EN 13284

Protea carried out monitoring under the company’s UKAS accreditation for BS EN 13284. Care was taken to implement the SRM as detailed in the MID for 13284 to get as valid a result as possible for calibrating the Particulate CEM.

There are currently discussions with both the Source Testing Association and the Environment Agency that Protea are involved in, with the aim of improving the QAL2 parallel measurements for particulates.

3.5 Deviation from the EN14181 Standard

No deviations from the standards are reported.

4. COMPARISON WITH PREVIOUS QAL2/AST TESTING

This is the first QAL2 test to be carried out.

END OF PART 1

Protea Report No R1208-1a Parts 1& 2
25th November 2008

PART 2: QAL2 COMPLIANCE REPORT EXECUTIVE SUMMARY

Calibration and Validation of Plant Continuous Emissions Monitoring System (QAL2)
Edenderry Power Ltd

The compliance report following is to be completed by the operator based on the findings of the QAL2 Report.

Executive Summary – BS EN14181 Compliance Report

Process Operator Edenderry Power Ltd			**License Register Number** PO482-02
Address Edenderry Power Station Ballykilleen Edenderry County Offaly Ireland			**Contact** Richard Neale/Seamus Burke **Tel No** 353 (469) 733892 **email** richard.neale@edenderrypower.ie / seamus.burke@edenderry power.ie
Tests carried out **delete where appropriate*	QAL2*	~~AST*~~	**Date test carried out:** 20/10/08 – 29/10/08

CEM System SICK GM31 Multi-gas analyser SICK FW101 Particulate Monitor ABB ZFG2 Oxygen Monitor	**MCERTS reference** MC 040038/01 MC 040041/00 MC 990001/03

Manufacturer/supplier SICK MAIHAK GmbH	ABB Ltd	
Address Nimburger Street 11 79276 Reute Germany	Oldends Lane Stonehouse Gloucester GL10 3TA UK	

Testing Laboratory Protea Ltd.	**UKAS Accreditation Number** 2515
Address First Avenue Crewe Cheshire CW1 6BG	**Contact** Andy Tiffen **Tel No** 01270 256256 **email** andy.tiffen@protea.ltd.uk

Report Ref R1208-1a Parts 1 & 2	**Date** 25th November 2008	
Did the tests comply with the standard? *If no supply details on separate sheet*	YES	~~NO~~
Are there any outstanding corrective actions? *If yes supply details on separate sheet*	~~YES~~	NO
Date QAL2 calibration function applied to the CEM		
Summary report submitted by :	**Name** **Organisation**	

APPENDIX 2

Emissions to Atmosphere - Monthly Mean Values

CDAS Monthly Report for Reportable Adjusted For January 2008

Report printed at 09:20:01 on the 23 March 2009

Date	Validated Daily Averages			Corrected Daily Averages		
	SO2 mg/m³	Dust mg/m³	NOx mg/m³	SO2 mg/m³	Dust mg/m³	NOx mg/m³
01-Jan-08	537.6	9.6	202.7	657.6	24.6	267.7
02-Jan-08	620.4	0	220.6	740.4	13.3	285.6
03-Jan-08	645.7	7.7	223.3	765.7	22.7	288.3
04-Jan-08	582.9	23.7	218.3	702.9	38.7	283.3
05-Jan-08	585.3	40.3	221	705.3	55.3	286
06-Jan-08	611.2	41.9	223.4	731.2	56.9	288.4
07-Jan-08	601.2	42.6	233.6	721.2	57.6	298.6
08-Jan-08	538.5	55	255.3	658.5	70	320.3
09-Jan-08	575.3	46.2	238.9	695.3	61.2	303.9
10-Jan-08	555.2	29.9	233.3	675.2	44.9	298.3
11-Jan-08	609.1	28.6	231.6	729.1	43.6	296.6
12-Jan-08	626.8	31.7	244.1	746.8	46.7	309.1
13-Jan-08	623.1	37.1	256.6	743.1	52.1	321.6
14-Jan-08	621.1	41.5	243.5	741.1	56.5	308.5
15-Jan-08	612.7	43.4	242.8	732.7	58.4	307.8
16-Jan-08	618.7	38.7	240.7	738.7	53.7	305.7
17-Jan-08	559.1	35.4	230.6	679.1	50.4	295.6
18-Jan-08	587	28.3	217.6	707	43.3	282.6
19-Jan-08	625.8	21.5	204.3	745.8	36.5	269.3
20-Jan-08	604.1	20.3	204.6	724.1	35.3	269.6
21-Jan-08	615.2	23.1	205.2	735.2	38.1	270.2
22-Jan-08	589.2	23.2	200.5	709.2	38.2	265.5
23-Jan-08	589.6	33.4	221.5	709.6	48.4	286.5
24-Jan-08	641.1	23	218.4	761.1	38	283.4
25-Jan-08	643	24.1	208.3	763	39.1	273.3
26-Jan-08	610.3	25	221.3	730.3	40	286.3
27-Jan-08	597.7	25.8	231.7	717.7	40.8	296.7
28-Jan-08	558.8	25.9	237.3	678.8	40.9	302.3
29-Jan-08	523.4	28.1	233.3	643.4	43.1	298.3
30-Jan-08	580.1	30.3	257.2	700.1	45.3	322.2
31-Jan-08	646.4	32.5	249.9	766.4	47.5	314.9
Monthly Average	**597.9**	**29.6**	**228.1**	**717.9**	**44.6**	**293.1**

01-Feb-08	627.3	30.3	236.6	747.3	45.3	301.6
02-Feb-08	634.7	29.5	224.2	754.7	44.5	289.2
03-Feb-08	542.5	29.8	217.8	662.5	44.8	282.8
04-Feb-08	628.5	30.7	225.3	748.5	45.7	290.3
05-Feb-08	664.6	31.9	226.2	784.6	46.9	291.2
06-Feb-08	614.9	29.2	229.2	734.9	44.2	294.2
07-Feb-08	549.7	29	225.5	669.7	44	290.5
08-Feb-08	564.6	26.5	219.9	684.6	41.5	284.9
09-Feb-08	558.8	27.3	217	678.8	42.3	282
10-Feb-08	490.7	28	222	610.7	43	287
11-Feb-08	544	24.9	218.2	664	39.9	283.2
12-Feb-08	657.8	27.5	228.6	777.8	42.5	293.6
13-Feb-08	580.2	25.7	229.4	700.2	40.7	294.4
14-Feb-08	588.3	25.9	222.9	708.3	40.9	287.9
15-Feb-08	621.9	19.9	205	741.9	34.9	270
16-Feb-08	602.2	19.3	211	722.2	34.3	276
17-Feb-08	604.7	23.9	225.5	724.7	38.9	290.5
18-Feb-08	558.8	23.2	223.1	678.8	38.2	288.1
19-Feb-08	605.8	23.3	229	725.8	38.3	294
20-Feb-08	637.9	29.3	253.6	757.9	44.3	318.6
21-Feb-08	607	26.4	253.4	727	41.4	318.4
22-Feb-08	607.9	24.8	248.1	727.9	39.8	313.1
23-Feb-08	638.1	23.8	249.8	758.1	38.8	314.8
24-Feb-08	597	24.1	237.2	717	39.1	302.2
25-Feb-08	614.4	27.6	239.8	734.4	42.6	304.8
26-Feb-08	642.2	28.6	231.2	762.2	43.6	296.2
27-Feb-08	590.3	25.2	219.5	710.3	40.2	284.5

28-Feb-08	598	23.2	219	718	38.2	284
29-Feb-08	573.4	27.2	226.6	693.4	42.2	291.6
Monthly Average	**598.2**	**26.4**	**228.1**	**718.2**	**41.4**	**293.1**

01-Mar-08	615.1	26.9	210.1	735.1	41.9	275.1
02-Mar-08	585.1	23.6	190.9	705.1	38.6	255.9
03-Mar-08	691.1	28.8	231.4	811.1	43.8	296.4
04-Mar-08	613.9	28	237.5	733.9	43	302.5
05-Mar-08	558.4	25.8	218.6	678.4	40.8	283.6
06-Mar-08	554.8	23.8	208.3	674.8	38.8	273.3
07-Mar-08	589.2	23.6	211.5	709.2	38.6	276.5
08-Mar-08	581.5	22.7	210	701.5	37.7	275
09-Mar-08	590.5	27.3	229.4	710.5	42.3	294.4
10-Mar-08	578.3	29.4	236.7	698.3	44.4	301.7
11-Mar-08	608.5	32.4	237.5	728.5	47.4	302.5
12-Mar-08	646.2	27.6	229.9	766.2	42.6	294.9
13-Mar-08	582.9	27.4	224.7	702.9	42.4	289.7
14-Mar-08	568.3	30	217.2	688.3	45	282.2
15-Mar-08	543.7	29.8	219.8	663.7	44.8	284.8
16-Mar-08	548	25.9	213.2	668	40.9	278.2
17-Mar-08	562.4	25.2	211.9	682.4	40.2	276.9
18-Mar-08	571.9	25.8	225.5	691.9	40.8	290.5
19-Mar-08	587	26.4	236.9	707	41.4	301.9
20-Mar-08	592.5	27.9	235.8	712.5	42.9	300.8
21-Mar-08	613.3	30.3	249.5	733.3	45.3	314.5
22-Mar-08	643.9	26.2	237.2	763.9	41.2	302.2
23-Mar-08	590.3	25.3	226.2	710.3	40.3	291.2
24-Mar-08	598.5	25.7	230.9	718.5	40.7	295.9
25-Mar-08	598	25.3	220.1	718	40.3	285.1
26-Mar-08	657.4	25.8	223.9	777.4	40.8	288.9
27-Mar-08	659.5	25	208.1	779.5	40	273.1
28-Mar-08	626.6	24.8	198.7	746.6	39.8	263.7
29-Mar-08	602.5	18.5	195.1	722.5	33.5	260.1
30-Mar-08	591.4	0	204.4	711.4	7	269.4
31-Mar-08	580.9	0	231.9	700.9	0	296.9
Monthly Average	**597.8**	**23.8**	**221.4**	**717.8**	**38.8**	**286.4**

01-Apr-08	602.4	23.4	220.3	722.4	38.4	285.3
02-Apr-08	615	22.1	213.6	735	37.1	278.6
03-Apr-08	542.4	20.8	211.9	662.4	35.8	276.9
04-Apr-08	588.6	22	216	708.6	37	281
05-Apr-08	604.7	23.3	216.9	724.7	38.3	281.9
06-Apr-08	643.6	22.3	226.4	763.6	37.3	291.4
07-Apr-08	637.1	23.5	241.9	757.1	38.5	306.9
08-Apr-08	610.5	22.3	223.5	730.5	37.3	288.5
09-Apr-08	643.2	23.3	220.8	763.2	38.3	285.8
10-Apr-08	603.7	24	227.9	723.7	39	292.9
11-Apr-08	658	32.5	229.6	778	47.5	294.6
12-Apr-08	Off	Off	Off	Off	Off	Off
13-Apr-08	Off	Off	Off	Off	Off	Off
14-Apr-08	Off	Off	Off	Off	Off	Off
15-Apr-08	Off	Off	Off	Off	Off	Off
16-Apr-08	493.8	19.1	219.6	613.8	34.1	284.6
17-Apr-08	565	11.1	217.9	685	26.1	282.9
18-Apr-08	628.4	3.9	224.7	748.4	18.9	289.7
19-Apr-08	608.5	0.3	219.7	728.5	15.3	284.7
20-Apr-08	646.6	0	216.1	766.6	13	281.1
21-Apr-08	635.6	0.1	210.4	755.6	15.1	275.4
22-Apr-08	593.6	7.4	197.6	713.6	22.4	262.6
23-Apr-08	581.8	7.8	199.2	701.8	22.8	264.2
24-Apr-08	586.4	4	207.1	706.4	19	272.1
25-Apr-08	591.5	4.3	212.5	711.5	19.3	277.5
26-Apr-08	588	5.4	204.9	708	20.4	269.9
27-Apr-08	640.4	8.4	205.3	760.8	23.3	270.5
28-Apr-08	627.7	10.6	221.5	747.7	25.6	286.5

29-Apr-08	629.7	14.7	216.9	749.7	29.7	281.9
30-Apr-08	604.3	15.9	221	724.3	30.9	286
Monthly Average	**525.7**	**14.3**	**217.1**	**629.7**	**29.2**	**282.1**

01-May-08	620.4	15	229	740.4	30	294
02-May-08	597.1	19.4	246.8	717.1	34.4	311.8
03-May-08	610.6	14.1	233.7	730.6	29.1	298.7
04-May-08	588.4	13.2	217.7	708.4	28.2	282.7
05-May-08	634.5	13.3	228.1	754.5	28.3	293.1
06-May-08	641.4	18	224.4	761.4	33	289.4
07-May-08	609.7	10.2	204.5	729.7	25.2	269.5
08-May-08	599.2	13.3	213.3	719.2	28.3	278.3
09-May-08	616	14	209.8	736	29	274.8
10-May-08	658.5	12.9	210.5	778.5	27.9	275.5
11-May-08	606.2	10.2	205.4	726.2	25.2	270.4
12-May-08	677.5	11.1	212.5	797.5	26.1	277.5
13-May-08	629.7	13.6	199.8	749.7	28.6	264.8
14-May-08	620.1	17.6	212	740.1	32.6	277
15-May-08	609.6	14.4	211.2	729.6	29.4	276.2
16-May-08	587.9	15.7	225	707.9	30.7	290
17-May-08	613.4	10.4	217.3	733.4	25.4	282.3
18-May-08	626.2	9.5	215.9	746.2	24.5	280.9
19-May-08	601.9	7.9	200.8	721.9	22.9	265.8
20-May-08	517.5	6.4	193.9	637.5	21.4	258.9
21-May-08	579.3	12.6	207.3	699.3	27.6	272.3
22-May-08	482	11.9	201.3	602	26.9	266.3
23-May-08	482.3	13.6	223.1	602.3	28.6	288.1
24-May-08	529.3	7.8	211.2	649.3	22.8	276.2
25-May-08	554.9	5.7	229.3	674.9	20.7	294.3
26-May-08	611.1	16.3	261.6	731.1	31.3	326.6
27-May-08	602.5	16.3	261.9	722.5	31.3	326.9
28-May-08	609.5	17.3	254.3	729.5	32.3	319.3
29-May-08	599.2	12.7	239.9	719.2	27.7	304.9
30-May-08	579	13.3	240.3	699	28.3	305.3
31-May-08	600.8	14	221.7	720.8	29	286.7
Monthly Average	**596.6**	**13**	**221.4**	**716.6**	**28**	**286.4**

01-Jun-08	605.1	15.6	222.3	725.1	30.6	287.3
02-Jun-08	579.3	19.1	237.4	699.3	34.1	302.4
03-Jun-08	594.6	20.8	232.3	714.6	35.8	297.3
04-Jun-08	585.9	22.9	213.8	705.9	37.9	278.8
05-Jun-08	609.6	21.9	220.1	729.6	36.9	285.1
06-Jun-08	664.2	23.7	234.9	784.2	38.7	299.9
07-Jun-08	556	23.4	234.6	676	38.4	299.6
08-Jun-08	538.5	17.8	224.7	658.5	32.8	289.7
09-Jun-08	586.1	9.1	227.2	706.1	24.1	292.2
10-Jun-08	575.2	15	258.1	695.2	30	323.1
11-Jun-08	584	12.7	226.2	704	27.7	291.2
12-Jun-08	591.5	14.4	222.5	711.5	29.4	287.5
13-Jun-08	578.1	13.8	229.1	698.1	28.8	294.1
14-Jun-08	619.4	14.6	232.4	739.4	29.6	297.4
15-Jun-08	604.5	9.6	222.3	724.5	24.6	287.3
16-Jun-08	605.8	10.4	229.8	725.8	25.4	294.8
17-Jun-08	605.3	12.7	223.4	725.3	27.7	288.4
18-Jun-08	579.4	15.4	219.4	699.4	30.4	284.4
19-Jun-08	584.9	15	234.5	704.9	30	299.5
20-Jun-08	573.8	10.3	226.5	693.8	25.3	291.5
21-Jun-08	576.6	10.6	227.1	696.6	25.6	292.1
22-Jun-08	587.8	11.4	232.9	707.8	26.4	297.9
23-Jun-08	628.4	11	226.7	748.4	26	291.7
24-Jun-08	592.8	12.9	235.1	712.8	27.9	300.1
25-Jun-08	591.1	14.2	228.4	711.1	29.2	293.4
26-Jun-08	636.9	12.9	225.7	756.9	27.9	290.7
27-Jun-08	656.8	13.4	225.5	776.8	28.4	290.5
28-Jun-08	643.4	9.3	215.3	763.4	24.3	280.3

29-Jun-08	621	8.5	246.1	741	23.5	311.1
30-Jun-08	639.1	5.2	215.7	759.1	20.2	280.7
Monthly Average	**599.8**	**14.3**	**228.3**	**719.8**	**29.3**	**293.3**

01-Jul-08	590.8	4.4	217.2	710.8	19.4	282.2
02-Jul-08	651.1	4.7	215.4	771.1	19.7	280.4
03-Jul-08	632.3	8.6	222.1	752.3	23.6	287.1
04-Jul-08	647.5	14.9	238.9	767.5	29.9	303.9
05-Jul-08	670.1	18.8	242.1	790.1	33.8	307.1
06-Jul-08	633.5	15	262.9	753.5	30	327.9
07-Jul-08	645.7	5.5	238.9	765.7	20.5	303.9
08-Jul-08	635.9	14	256.5	755.9	29	321.5
09-Jul-08	580.5	9	261.5	700.5	24	326.5
10-Jul-08	525.7	4.6	226.8	645.7	19.6	291.8
11-Jul-08	388.9	6.3	284.7	508.9	21.3	349.7
12-Jul-08	Off	Off	Off	Off	Off	Off
13-Jul-08	Off	Off	Off	Off	Off	Off
14-Jul-08	Off	Off	Off	Off	Off	Off
15-Jul-08	Off	Off	Off	Off	Off	Off
16-Jul-08	Off	Off	Off	Off	Off	Off
17-Jul-08	Off	Off	Off	Off	Off	Off
18-Jul-08	Off	Off	Off	Off	Off	Off
19-Jul-08	Off	Off	Off	Off	Off	Off
20-Jul-08	Off	Off	Off	Off	Off	Off
21-Jul-08	Off	Off	Off	Off	Off	Off
22-Jul-08	Off	Off	Off	Off	Off	Off
23-Jul-08	Off	Off	Off	Off	Off	Off
24-Jul-08	Off	Off	Off	Off	Off	Off
25-Jul-08	Off	Off	Off	Off	Off	Off
26-Jul-08	Off	Off	Off	Off	Off	Off
27-Jul-08	Off	Off	Off	Off	Off	Off
28-Jul-08	Off	Off	Off	Off	Off	Off
29-Jul-08	Off	Off	Off	Off	Off	Off
30-Jul-08	Off	Off	Off	Off	Off	Off
31-Jul-08	Off	Off	Off	Off	Off	Off
Monthly Average	**213.0**	**9.6**	**242.5**	**255.5**	**24.6**	**307.5**

01-Aug-08	Off	Off	Off	Off	Off	Off
02-Aug-08	Off	Off	Off	Off	Off	Off
03-Aug-08	Off	Off	Off	Off	Off	Off
04-Aug-08	Off	Off	Off	Off	Off	Off
05-Aug-08	Off	Off	Off	Off	Off	Off
06-Aug-08	Off	Off	Off	Off	Off	Off
07-Aug-08	Off	Off	Off	Off	Off	Off
08-Aug-08	Off	Off	Off	Off	Off	Off
09-Aug-08	Off	Off	Off	Off	Off	Off
10-Aug-08	Off	Off	Off	Off	Off	Off
11-Aug-08	Off	Off	Off	Off	Off	Off
12-Aug-08	Off	Off	Off	Off	Off	Off
13-Aug-08	Off	Off	Off	Off	Off	Off
14-Aug-08	Off	Off	Off	Off	Off	Off
15-Aug-08	Off	Off	Off	Off	Off	Off
16-Aug-08	Off	Off	Off	Off	Off	Off
17-Aug-08	Off	Off	Off	Off	Off	Off
18-Aug-08	Off	Off	Off	Off	Off	Off
19-Aug-08	423.6	41.4	359.8	543.6	56.4	424.8
20-Aug-08	454.6	13.1	228.4	574.6	28.1	293.4
21-Aug-08	499.3	0	219.3	619.3	13.3	284.3
22-Aug-08	630.8	4.7	218.3	750.8	19.7	283.3
23-Aug-08	640	6.1	237.6	760	21.1	302.6
24-Aug-08	669.8	9.8	237.4	789.8	24.8	302.4
25-Aug-08	635.8	0	204.8	755.8	11.2	269.8
26-Aug-08	603.5	0	251.9	723.5	12	316.9
27-Aug-08	602.8	0	235.5	722.8	13.3	300.5
28-Aug-08	615.8	0.2	257.7	735.8	15.2	322.7

29-Aug-08	626.4	5.2	251.9	746.4	20.2	316.9
30-Aug-08	643.6	3.5	247.4	763.6	18.5	312.4
31-Aug-08	628.5	0	225.5	748.5	14.6	290.5
Monthly Average	**247.6**	**5.6**	**244.3**	**297.9**	**20.6**	**309.3**

01-Sep-08	618.8	0	230.6	738.8	13	295.6
02-Sep-08	615.7	0	242.6	735.7	13.9	307.6
03-Sep-08	611.7	0.4	246.1	731.7	15.4	311.1
04-Sep-08	578.8	1.9	256.5	698.8	16.9	321.5
05-Sep-08	583.6	0	268	703.6	15	333
06-Sep-08	596.8	13.3	269.2	716.8	28.3	334.2
07-Sep-08	523.1	8.1	277.1	643.1	23.1	342.1
08-Sep-08	507.3	8.3	239.7	627.3	23.3	304.7
09-Sep-08	573.8	0.6	220.7	693.8	15.6	285.7
10-Sep-08	561.9	4.2	249.6	681.9	19.2	314.6
11-Sep-08	569.6	6.4	256.2	689.6	21.4	321.2
12-Sep-08	552.3	6.6	242.4	672.3	21.6	307.4
13-Sep-08	575.9	6.2	240.1	695.9	21.2	305.1
14-Sep-08	592.4	5.1	238.3	712.4	20.1	303.3
15-Sep-08	599	4.3	247	719	19.3	312
16-Sep-08	565.7	9.3	259.5	685.7	24.3	324.5
17-Sep-08	588.7	12.8	260.5	708.7	27.8	325.5
18-Sep-08	529	15.3	255.1	649	30.3	320.1
19-Sep-08	535.1	13.6	254.4	655.1	28.6	319.4
20-Sep-08	563	8.2	238.7	683	23.2	303.7
21-Sep-08	583.5	3.9	242.2	703.5	18.9	307.2
22-Sep-08	601.5	9.3	264.2	721.5	24.3	329.2
23-Sep-08	625.1	23.4	251.9	745.1	38.4	316.9
24-Sep-08	652.6	12.7	244.9	772.6	27.7	309.9
25-Sep-08	635.1	9.4	240.4	755.1	24.4	305.4
26-Sep-08	664.8	15.5	247.2	784.8	30.5	312.2
27-Sep-08	628.5	14.6	252.3	748.5	29.6	317.3
28-Sep-08	643.4	12.2	252.4	763.4	27.2	317.4
29-Sep-08	624.1	11.3	242.1	744.1	26.3	307.1
30-Sep-08	549.1	16	246.9	669.1	31	311.9
Monthly Average	**588.3**	**8.3**	**249.2**	**708.3**	**23.3**	**314.2**

01-Oct-08	519.4	10.4	238.9	639.4	25.4	303.9
02-Oct-08	494.5	22.8	247.8	614.5	37.8	312.8
03-Oct-08	420	9.9	211.5	540	24.9	276.5
04-Oct-08	452.3	16.7	226.9	572.3	31.7	291.9
05-Oct-08	610	12.2	214.4	730	27.2	279.4
06-Oct-08	505.6	13.4	222.7	625.6	28.4	287.7
07-Oct-08	575.8	18.6	238.2	695.8	33.6	303.2
08-Oct-08	581.4	18.9	238.3	701.4	33.9	303.3
09-Oct-08	519.4	21	232.6	639.4	36	297.6
10-Oct-08	542.1	19.7	232.3	662.1	34.7	297.3
11-Oct-08	585.6	16.1	223.1	705.6	31.1	288.1
12-Oct-08	515.9	16.5	228.4	635.9	31.5	293.4
13-Oct-08	655.8	17	234.1	775.8	32	299.1
14-Oct-08	637.2	10.5	230	757.2	25.5	295
15-Oct-08	589.2	16.6	236	709.2	31.6	301
16-Oct-08	574.6	18.6	243	694.6	33.6	308
17-Oct-08	534.5	10.9	222.4	654.5	25.9	287.4
18-Oct-08	520	10.8	228.1	640	25.8	293.1
19-Oct-08	549.9	12.1	236.1	669.9	27.1	301.1
20-Oct-08	574.9	15.5	243.5	694.9	30.5	308.5
21-Oct-08	633.4	19.7	244.4	753.4	34.7	309.4
22-Oct-08	584.7	17.2	241.3	704.7	32.2	306.3
23-Oct-08	594.1	15.5	246.6	714.1	30.5	311.6
24-Oct-08	551.1	18.2	240.9	671.1	33.2	305.9
25-Oct-08	493.4	15	241.3	613.4	30	306.3
26-Oct-08	434	16.2	241.9	554	31.2	306.9
27-Oct-08	462.3	19.5	244.7	582.3	34.5	309.7
28-Oct-08	494.9	17.3	246.9	614.9	32.3	311.9

29-Oct-08	540.3	15.6	248.4	660.3	30.6	313.4
30-Oct-08	576.9	22	254.7	696.9	37	319.7
31-Oct-08	611.5	27.4	257	731.5	42.4	322
Monthly Average	**546.3**	**16.5**	**236.7**	**666.3**	**31.5**	**301.7**

01-Nov-08	574.3	32.9	257	694.3	47.9	322
02-Nov-08	648.4	28.6	248.9	768.4	43.6	313.9
03-Nov-08	616.5	24.2	248.9	736.5	39.2	313.9
04-Nov-08	626.3	25.3	243.5	746.3	40.3	308.5
05-Nov-08	661.1	12.8	239.8	781.1	27.8	304.8
06-Nov-08	653.4	18	255.6	773.4	33	320.6
07-Nov-08	640.5	20.8	275.2	760.5	35.8	340.2
08-Nov-08	654.6	30.7	279.5	774.6	45.7	344.5
09-Nov-08	658.5	28.5	258.8	778.5	43.5	323.8
10-Nov-08	616.3	29.1	250.9	736.3	44.1	315.9
11-Nov-08	603.8	27.6	251.5	723.8	42.6	316.5
12-Nov-08	480.4	18.4	245.6	600.4	33.4	310.6
13-Nov-08	531.1	15	257.6	651.1	30	322.6
14-Nov-08	567.6	22.3	252.6	687.6	37.3	317.6
15-Nov-08	627.6	20.7	225	747.6	35.7	290
16-Nov-08	614.6	18.8	209	734.6	33.8	274
17-Nov-08	584.4	27.6	243.2	704.4	42.6	308.2
18-Nov-08	610.2	31.8	252.8	730.2	46.8	317.8
19-Nov-08	578.2	31.4	263.6	698.2	46.4	328.6
20-Nov-08	585.4	14.7	248.6	705.4	29.7	313.6
21-Nov-08	575.1	14.4	233.1	695.1	29.4	298.1
22-Nov-08	623	8.2	237.3	743	23.2	302.3
23-Nov-08	506.8	4.5	259.5	626.8	19.5	324.5
24-Nov-08	551.9	5.2	263.6	671.9	20.2	328.6
25-Nov-08	606.3	5.3	255.4	726.3	20.3	320.4
26-Nov-08	565.4	12.3	254.6	685.4	27.3	319.6
27-Nov-08	511	6.6	236.9	631	21.6	301.9
28-Nov-08	484	6.1	256.8	604	21.1	321.8
29-Nov-08	559.2	4.9	245.8	679.2	19.9	310.8
30-Nov-08	511.1	6	259.6	631.1	21	324.6
Monthly Average	**587.6**	**18.4**	**250.3**	**707.6**	**33.4**	**315.3**

01-Dec-08	562.7	6.3	255.7	682.7	21.3	320.7
02-Dec-08	588.7	6.3	252.1	708.7	21.3	317.1
03-Dec-08	567.9	10.2	255.3	687.9	25.2	320.3
04-Dec-08	591.6	15.1	255.7	711.6	30.1	320.7
05-Dec-08	547.5	15	254	667.5	30	319
06-Dec-08	530.7	15.3	249	650.7	30.3	314
07-Dec-08	536.6	16.7	255.2	656.6	31.7	320.2
08-Dec-08	522.4	13.2	253.9	642.4	28.2	318.9
09-Dec-08	548.9	11.1	247.2	668.9	26.1	312.2
10-Dec-08	492	15.4	250.9	612	30.4	315.9
11-Dec-08	470.3	18.1	250.8	590.3	33.1	315.8
12-Dec-08	513.5	13.4	252.3	633.5	28.4	317.3
13-Dec-08	569.3	11.9	243.3	689.3	26.9	308.3
14-Dec-08	596.5	6.1	232.5	716.5	21.1	297.5
15-Dec-08	608.5	6.2	244.7	728.5	21.2	309.7
16-Dec-08	615.5	5	246.3	735.5	20	311.3
17-Dec-08	629.4	9	256.5	749.4	24	321.5
18-Dec-08	615.3	12.9	260.2	735.3	27.9	325.2
19-Dec-08	589.7	18.7	251	709.7	33.7	316
20-Dec-08	556.1	21.5	257.1	676.1	36.5	322.1
21-Dec-08	576.3	20.6	259.7	696.3	35.6	324.7
22-Dec-08	655.8	17.3	259.7	775.8	32.3	324.7
23-Dec-08	644.5	13.2	246.5	764.5	28.2	311.5
24-Dec-08	611.8	12.2	243.6	731.8	27.2	308.6
25-Dec-08	664.5	9.6	245.8	784.5	24.6	310.8
26-Dec-08	785.8	17	248.1	905.8	32	313.1
27-Dec-08	Off	Off	Off	Off	Off	Off
28-Dec-08	Off	Off	Off	Off	Off	Off

29-Dec-08	Off	Off	Off	Off	Off	Off
30-Dec-08	Off	Off	Off	Off	Off	Off
31-Dec-08	Off	Off	Off	Off	Off	Off
Monthly Average	**490.1**	**13**	**251**	**590.7**	**28**	**316**

APPENDIX 3

Licence Specific Reports

AN ASSESSMENT OF THE RIVER TEMPERATURE MONITORING LOCATIONS AT THE EDENDERRY POWER FACILITY, IN COMPLIANCE WITH CONDITION 6.18.3 OF INTEGRATED POLLUTION PREVENTION AND CONTROL LICENCE P0482-03

For the Attention of:
Mr. Richard Neale
Edenderry Power, Ltd.,
Edenderry,
Co. Offaly

Prepared by:
Ms. Natalie Duncan
Environmental Scientist

Reviewed by:

Report No.: ECS3241
Date: March 2009

Executive Summary

Bord na Móna Technical Services (TS) was requested by Richard Neale, from Edenderry Power Limited, to prepare a quotation for a surface water assessment in compliance with Condition 6.18.3 of its IPPC Licence Register Number P0482-03. An assessment of the Figile River was carried out to determine the mixing zone for the temperature of the existing process water discharges from Edenderry Power Station, Edenderry, Co. Offaly. Two Environmental Scientist from Bord na Móna visited the site on the 9th of March 2009 to undertake this assessment of the watercourse. The assessment methodology was based on the method described in Section 2.4.28 of the EPA publication "The Environmental Protection Agency Act, 1992 (Urban Waste Water Treatment) Regualtions, 1994 – A Handbook on Implementation for Sanitary Authorities" (EPA, 1996).

During the assessment, the ambient temperature was 9.1°C and there was a trace amount of precipitation. The flow rate of the River Figile was 92,946m^3/day. The average temperature and the flow rate of the discharge were 10.3°C and 938.1m^3/day respectively.

The river temperature at the point of discharge was 10°C. Following the length of the river, the temperature decreases rapidly to 5.5°C after approximately 8m. Regular temperature readings of 5.5°C were obtained after approximately 30m, which is approximately 7m upstream of the downstream temperature probe; however, following the width of the river, there is a marked temperature decrease approximately 2-3m from the left bank (the side from which the discharge enters the river). These findings suggest that mixing is contained mainly within 2-3m from the left bank.

It is considered that measures should be made to ensure mixing occurs, as much as practicable, throughout the breadth of the river. Once these measures are in place, a further assessment of the mixing zone should be carried out in order to calculate whether the downstream temperature probe is in the appropriate location.

Submitted by,

Ms. Natalie Duncan
Environmental Scientist

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SECTION 5: DISCUSSION

SECTION 1: INTRODUCTION

An assessment of the Figile River was carried out to determine the mixing zone for the temperature of the existing process water discharges from Edenderry Power Station, Edenderry, Co. Offaly, in compliance with Condition 6.18.3 of its IPPC Licence Register Number P0482-03. The assessment methodology for measuring the extent of the mixing zone was based on the method described in Section 2.4.28 of the EPA publication "The Environmental Protection Agency Act, 1992 (Urban Waste Water Treatment) Regualtions, 1994 – A Handbook on Implementation for Sanitary Authorities" (EPA, 1996). Two Environmental Scientist from Bord na Móna visited the site on the 9th of March 2009 to undertake this assessment of the watercourse.

SECTION 2: SAMPLING LOCATION

The location of the sampling area and the Figile River is shown in Figure 1 below. Figure 2 illustrates the sampling area.

Figure 1: Location of Sampling Area

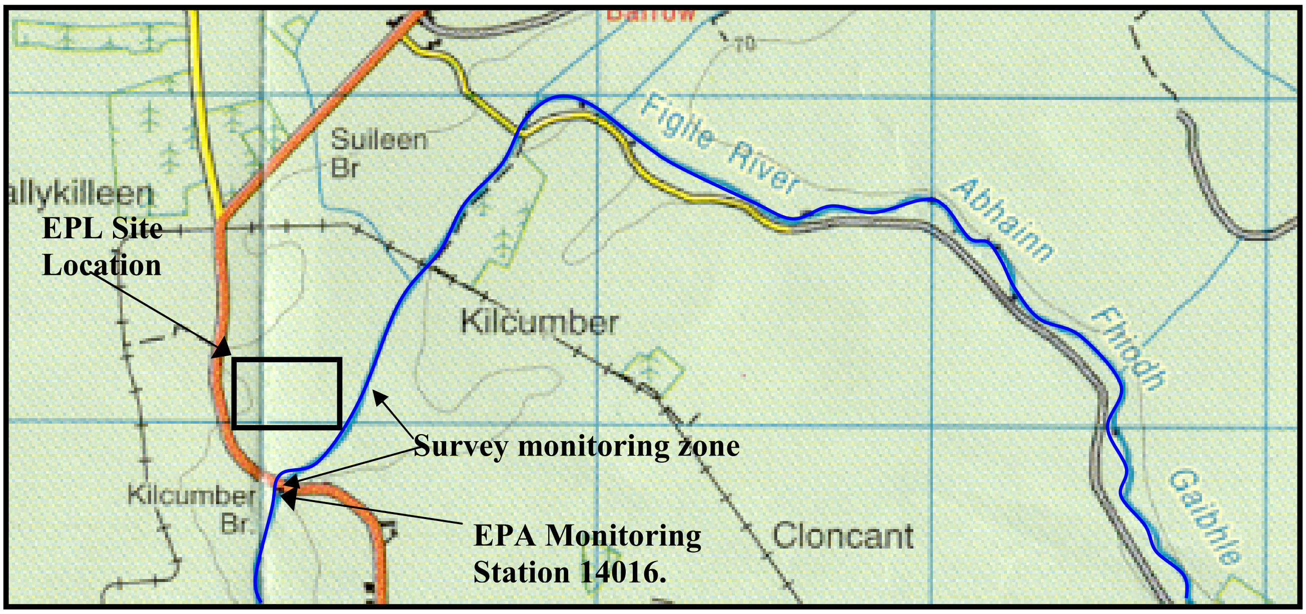


Figure 2: Sampling Area

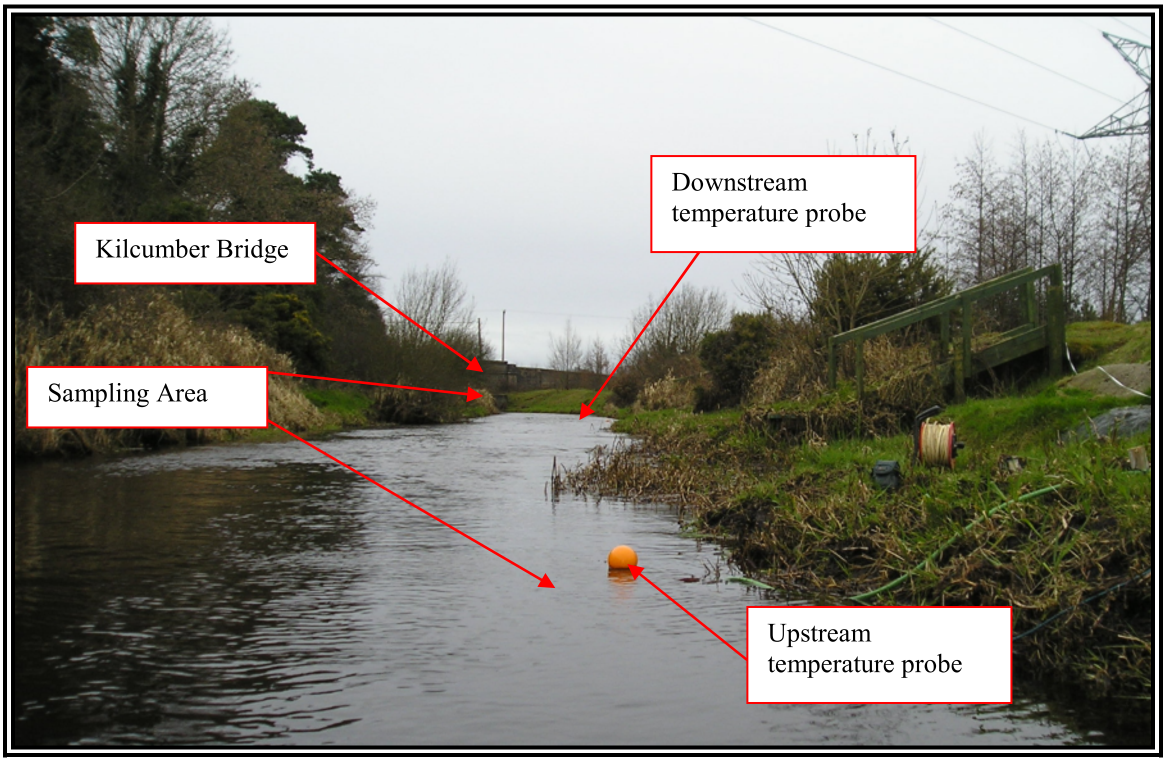
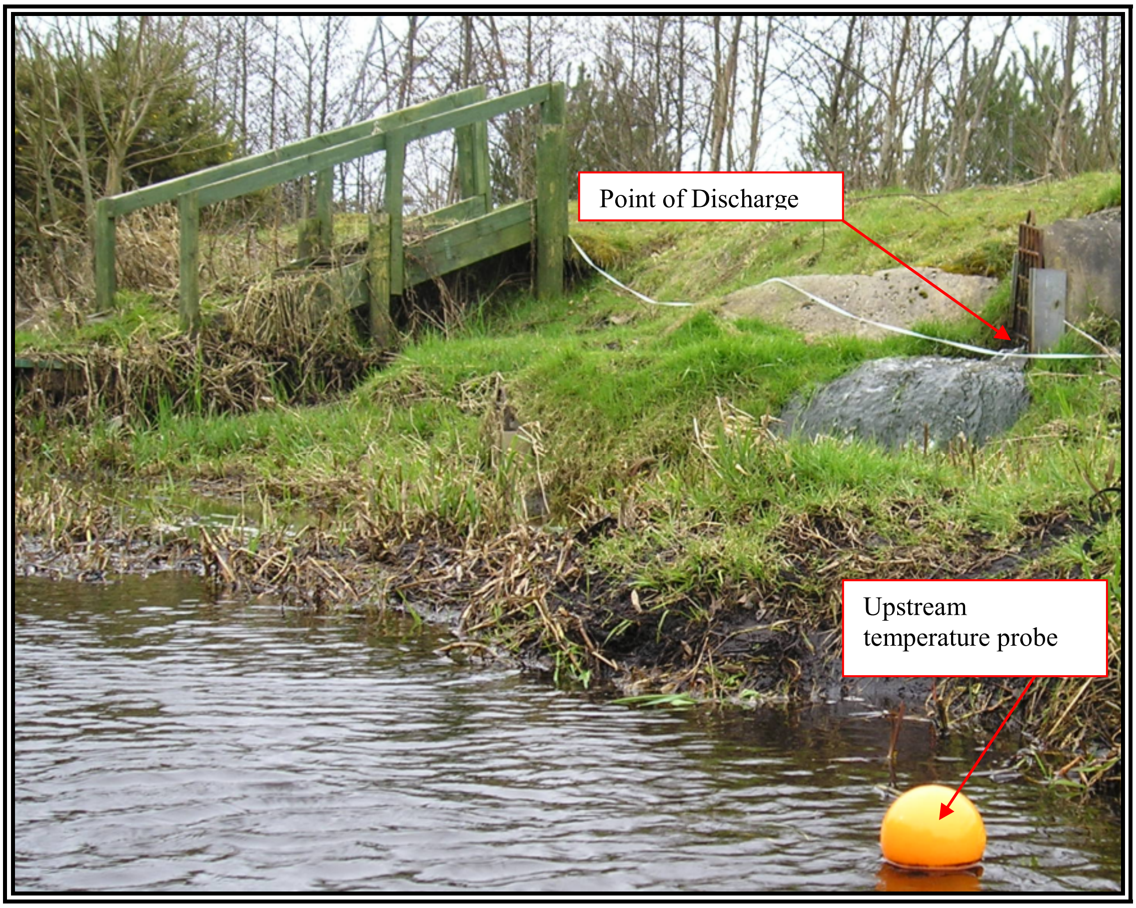


Figure 3: Location of Discharge Point



SECTION 3: METHODOLOGIES

The assessment methodology for measuring the extent of the mixing zone was based on the method described in Section 2.4.28 of the EPA publication "The Environmental Protection Agency Act, 1992 (Urban Waste Water Treatment) Regualtions, 1994 – A Handbook on Implementation for Sanitary Authorities" (EPA, 1996).

On the day of sampling:

- Temperature and flow readings were taken, for both the River Figile (upstream of the discharge) and the discharge.

- Temperature measurements were taken at points in a grid (downstream of the effluent discharge), at regular intervals, both across the width and down the length of the River Figile, until temperature readings were constant.

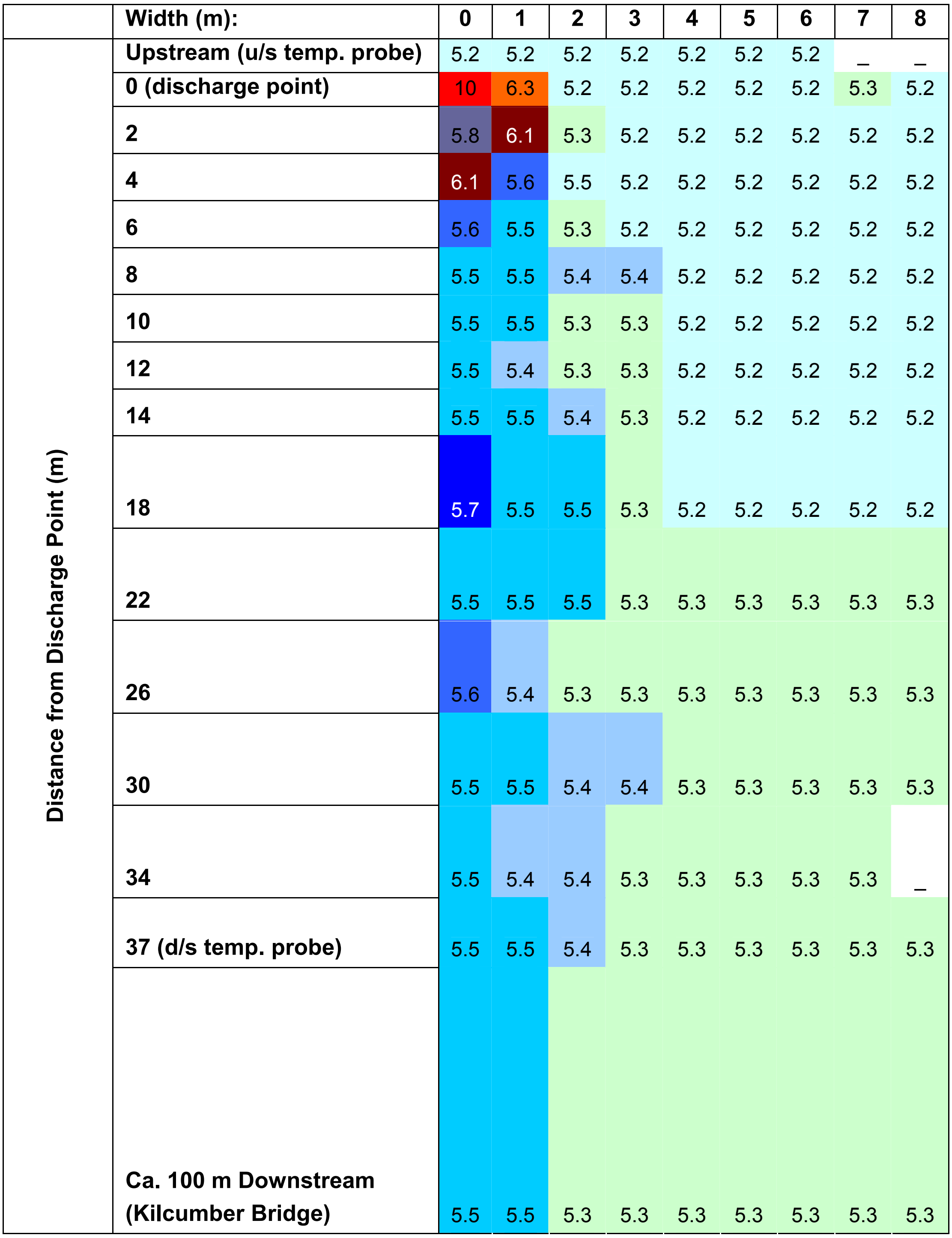
Figure 4: Sampling Method

SECTION 4: PRESENTATION OF RESULTS

Table 1: Weather and flow conditions at time of sampling (9th March 2009)

Ambient Temp (°C):	9.1	
Rainfall (mm):	Trace	(13:15 - 15:00)
River Flow (m^3/day):	92,946.69	
Ave. Discharge Temp (°C):	10.3	(13:15 - 15:00)
Ave. Discharge Flow (m^3/day):	938.1	(13:15 - 15:00)

Figure 5: Temperature profile of river (9th March 2009)



	Width (m):	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Distance from Discharge Point (m)	**Upstream (u/s temp. probe)**	5.2	5.2	5.2	5.2	5.2	5.2	5.2	_	_
	0 (discharge point)	10	6.3	5.2	5.2	5.2	5.2	5.2	5.3	5.2
	2	5.8	6.1	5.3	5.2	5.2	5.2	5.2	5.2	5.2
	4	6.1	5.6	5.5	5.2	5.2	5.2	5.2	5.2	5.2
	6	5.6	5.5	5.3	5.2	5.2	5.2	5.2	5.2	5.2
	8	5.5	5.5	5.4	5.4	5.2	5.2	5.2	5.2	5.2
	10	5.5	5.5	5.3	5.3	5.2	5.2	5.2	5.2	5.2
	12	5.5	5.4	5.3	5.3	5.2	5.2	5.2	5.2	5.2
	14	5.5	5.5	5.4	5.3	5.2	5.2	5.2	5.2	5.2
	18	5.7	5.5	5.5	5.3	5.2	5.2	5.2	5.2	5.2
	22	5.5	5.5	5.5	5.3	5.3	5.3	5.3	5.3	5.3
	26	5.6	5.4	5.3	5.3	5.3	5.3	5.3	5.3	5.3
	30	5.5	5.5	5.4	5.4	5.3	5.3	5.3	5.3	5.3
	34	5.5	5.4	5.4	5.3	5.3	5.3	5.3	5.3	_
	37 (d/s temp. probe)	5.5	5.5	5.4	5.3	5.3	5.3	5.3	5.3	5.3
	Ca. 100 m Downstream (Kilcumber Bridge)	5.5	5.5	5.3	5.3	5.3	5.3	5.3	5.3	5.3

SECTION 5: DISCUSSION

Table 1, above, shows the weather and flow conditions of the Figile River and the discharge at the time of sampling on, the 9th of March 2009 (13:15 – 15:00). The ambient temperature was 9.1°C and there was a trace amount of precipitation. The flow rate of the River Figile was 92,946m^3/day. The average temperature and the flow rate of the discharge were 10.3°C and 938.1m^3/day respectively.

Figure 5, above, shows the temperature profile of the River Figile, from the upstream temperature probe (approximately 2m upstream of the discharge) to Kilcumber Bridge (approximately 100m downstream of the discharge) on the 9th of March 2009 (13:15 – 15:00). The upstream temperature of the river was 5.2°C. The river temperature at the point of discharge was 10°C. Following the length of the river, the temperature decreases rapidly to 5.5°C after approximately 8m. Regular temperature readings of 5.5°C were obtained after approximately 30m, which is 7m upstream of the downstream temperature probe; however, following the width of the river, there is a marked temperature decrease approximately 2-3m from the left bank (the side from which the discharge enters the river). These findings suggest that mixing is contained mainly within 2-3m from the left bank of the river.

It is considered that measures should be made to ensure mixing occurs, as much as practicable, throughout the breadth of the river. Once these measures are in place, a further assessment of the mixing zone should be carried out in order to calculate whether the downstream temperature probe is in the appropriate location.

Project-information

Project name:	Contract number:	Contact:	Date:
Edenderry Power Process		**Peter Gillespie**	**29/08/2008**

Client	**Edenderry Power**
Contact:	**Peter Gillispie**
Position:	
Road	**Ballykilleen**
Town	**Edenderry**
County	**Co. Offally**
Telephone:	**046 9733800**
Fax:	**046 9733801**
Mobile:	**087 6483556**
E-Mail:	

Site	**Edenderry Power**
Contact:	**Peter Gillespie**
Position:	**Process Relining**
Road	**Ballykilleen**
Town	**Edenderry**
County	**Co. Offally**
Telephone:	**046 9733800**
Fax:	**046 9733801**
Mobile:	**087 6483556**
E-Mail:	

Contractor	**AQS Enviromental Solutions**
Contact:	**Kathy McDonald**
Position:	**Specialist Drain Services**
Road	**Archerstown Industrial Estate**
Town	**Thurles**
County	**Co. Tipperary**
Telephone:	**0504 57800**
Fax:	**0504 57801**
Mobile:	**086 8229636**
E-Mail:	**kathy@aqssolutions.ie**

AQS Enviromental Solutions
Thurles
Co. Tipperary
Tel: 0504 57800, Fax: 0504 57801

Defect Grade Description

Project name: **Edenderry Power Process**	Contract number:	Contact: **Peter Gillespie**	Date: **29/08/2008**

1:	Occurances without damage: for example, laterals, joints etc. **NO DEFECTS WERE DETECTED.**
2:	Constructional deficiencies or occurances with insignificant influence to tightness, hydraulic or static pressure of pipe: f.e. wide joints, badly torched intakes, minor deformation of plastic pipes, minor erosions etc. **REHABILITATION CAN BE SCHEDULED LONG-TERM.**
3:	Constructional deficiencies diminishing static, hydraulic and tightness: f.e. open joints, untorched intakes, cracks, minor drainage obstructions such as calcide build ups, protruding laterals, minor damages to pipe wall, individual root penetrations, corroded pipe walls etc. **REHABILITATION IS NECESSARY MEDIUM-TERM WITHIN 3 TO 5 YEARS.**
4:	Constructional damages with nonsufficient static safety, hydraulic or tightness: f.e. axial/radial pipebursts, pipe deformations, visually noticeable infiltration/exfiltration, cavities in pipe-wall, severe protruding, laterals severe root penetrations, severe corrosion of pipe wall etc. **REHABILITATION PROCEDURE IS URGENT AND HAS TO BE COMPLETED WITHIN 1 TO 2 YEARS. NECESSITY FOR EMERCENCY OPERATIONS HAS TO BE EXAMINED.**
5:	Pipe is already or will shortly be impermeable: f.e. collapsed pipe, deeply rooted pipe or other drainage obstructions. Pipe loses water or danger of backwater in basements etc. **REHABILITATION IS URGENT AND SHORT-TERM. IN ORDER TO PREVENT FURTHER DAMAGE, NECESSARY TEMPORARY SPOT REPAIR HAS TO BE CONDUCTED ON EMERGENCY LEVEL.**

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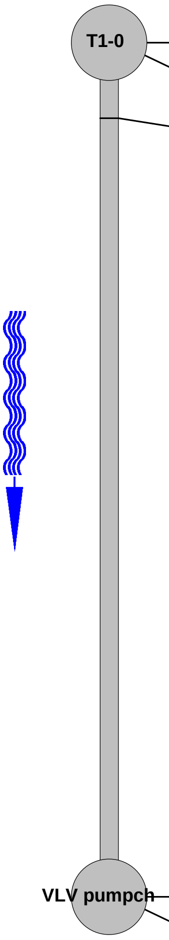
Inspection report

Date: **29/08/2008**	Job N°:	Weather: **No rain or snow**	Operator: **Warren**	section number: **1**	PLR: **T1-0 X**
Video Volume No.:	Flow Ctrl: **No flow control**	Temperature: **above freezing**	Year laid:	Cleaned: **Yes**	Strat. Drain:

Road:	**Edenderry**	Div/Dist:		start MH:	**T1-0**
Place:	**Edenderry Power**	Drain. Area:		end MH:	**VLV pumpch**
Location:		Standard:	**BS EN 13508-2:2003**	Total length:	**11.3 m**

Purpose:	**Post inspection of repairs or renovations**	Size/Shape:	**Circular 100**
Type:	**Rising main**	Material:	**Vitrified clay (i.e. all clayware)** Pipe length:
Use:	**Trade effluent**	Lining:	
		Lining Type:	

Comment:



1:100	position	code	observation	counter	photo	grade
	0.00	MH	Start node type, manhole, reference number: T1-0	00:00:00		0
	0.00	WL	Water level 00 % height/diameter	00:00:00		0
	1.00	REM	General remark, Remark: pipe relining start	00:00:00		
	11.30	REM	General remark, Remark: pipe relining finish	00:00:00		
	11.30	MHF	Finish node type, manhole, reference number: VLV pumpch	00:00:00		

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Thurles
Co. Tipperary
Tel: 0504 57800, Fax: 0504 57801

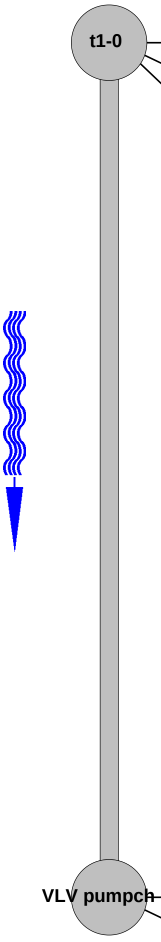
Inspection report

Date: **29/08/2008**	Job N°:	Weather: **No rain or snow**	Operator: **Warren**	section number: **2**	PLR: **t1-0 X**
Video Volume No.:	Flow Ctrl: **No flow control**	Temperature: **above freezing**	Year laid:	Cleaned:	Strat. Drain:

Road:	**Edenderry**	Div/Dist:		start MH:	**t1-0**
Place:	**Edenderry Power**	Drain. Area:		end MH:	**VLV pumpch**
Location:		Standard:	**BS EN 13508-2:2003**	Total length:	**11.3 m**

Purpose:	**Post inspection of repairs or renovations**	Size/Shape:	**Circular 100**
Type:	**Rising main**	Material:	**Vitrified clay (i.e. all clayware)** Pipe length:
Use:	**Trade effluent**	Lining:	
		Lining Type:	

Comment:



1:100	position	code	observation	counter	photo	grade
	0.00	MH	Start node type, manhole, reference number: t1-0	00:00:00		0
	0.00	WL	Water level 00 % height/diameter	00:00:00		0
	0.00	REM	General remark, Remark: pipe relining start	00:00:00		
	11.30	REM	General remark, Remark: pipe relining finish	00:00:00		
	11.30	MHF	Finish node type, manhole, reference number: VLV pumpch	00:00:00		

AQS ENVIRONMENTAL SOLUTIONS

Head Office
Archerstown Industrial Estate,
Thurles,
Co. Tipperary,
Ireland

Project No: QRS / 261

Date: 28th August 2008

Site: Edenderry Power
Ballykilleen
Co. Offaly

RE: Relining of process lines at the above address.

To Whom It May Concern:

This is confirmation that relining repairs were carried out by AQS Environmental Solutions at Edenderry Power on 7th August 2008. We can now confirm that the Process Drains (T1-0 to VLV pumpchamber & T1-0 to pumpchamber 2) is now free from any known defects as is in sound condition.

Should you require any further assistance, please do not hesitate to contact us.

Kind Regards

John Canny	Kathy McDonald
Regional Manager	Specialist Drain Services (OS19X)