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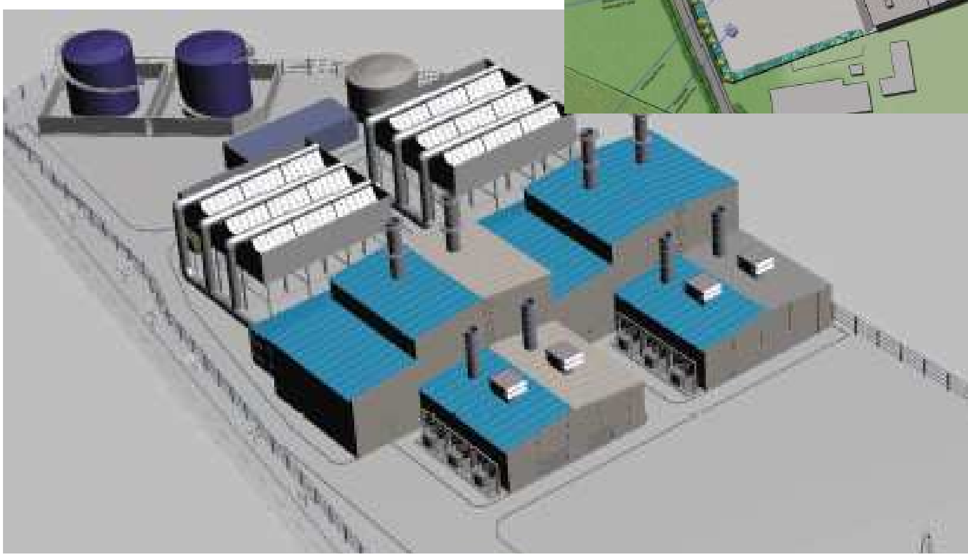
Project: Environmental Impact Statement

Proposed Gas Fired Power Station at Lumcloon, Cloghan, Co. Offaly

Date: August 2009



LUMCLOON energy

creative minds safe hands

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1.0 INTRODUCTION

1.1 GENERAL

This Environmental Impact Statement (EIS) has been prepared to accompany an application to An Bord Pleanála for full planning permission for the development of a gas power plant at Lumcloon, Cloghan, Ferbane, Co. Offaly (OSI ITM Ref. 613700 719700). This EIS will also be submitted to the Environmental Protection Agency (EPA) in support of an application for an Integrated Pollution Prevention and Control (IPPC) licence for the proposed facility.

Lumcloon Energy Limited (Lumcloon Energy), the applicant company, was established in November 2008 and comprises R & R Mechanical Limited and Terotech International Limited. Further details regarding the company and the company shareholders are detailed in Section 1.1.

Lumcloon Energy is applying for full planning permission for this development on lands under the company's control in the town land of Lumcloon, approximately 5km south east of Ferbane, 22km south of Athlone and 20km west of Tullamore. A site location map is shown on Figure 1.1. The site is a brownfield site and formed part of the former ESB owned peat fired power station site which was fully decommissioned in 2004. The ESB subsequently obtained planning permission in 2004 for a 100MW gas fired power plant at the site, but never proceed with the proposed development. There are large parcels of cutaway bogland and forestry to the south west and north-west of the site and industrial railway associated with the former peat power station runs out from the former peat power station to the surrounding boglands. The surrounding topography is generally flat with nearby once-off rural housing primarily located south west of the site along a local road which borders the site to the west and runs in a south western direction from the R357 to the R437. The existing site layout is shown on Figure 1.2.

1.2 APPLICANT COMPANY

Lumcloon Energy was established in November 2008 as a registered company and its current shareholders are R & R Mechanical Limited (Mechanical Engineering Contractors), Millennium House, Main Street, Tullamore, Co. Offaly, and Terotech International Limited (Engineering and Power Development Company), 18 Gardiner Place, Dublin 1.

R and R Mechanical Limited is a power plant erection and maintenance company with a client base that includes ESB, World Bank, General Electric, Alstom, Siemens, Synergen and the

Northern Power Service Company (an associate company of Electricity Corporation of Vietnam).

Terotech International Limited is a power and engineering development company with its main business base in Vietnam. Its client base includes the World Bank, the European Bank for Reconstruction and Development, Ministry of Industry and Energy Vietnam, ESB International, Mitsui and Company Limited and The World Investment Finance Company UK. Terotech provides consultancy services in the areas of power plant design, construction, operation and maintenance and Independent Power plant development and private investment funding coordination. The company has executed many projects in Vietnam, Cambodia, China, Honduras, Romania, Belarus and Mongolia.

1.3 REGULATORY FRAMEWORK

1.3.1 Strategic Infrastructure Development

A preliminary meeting was held with Offaly County Council in February 2009 to notify the planning department of, and discuss the proposed development. Offaly County Council recommended that An Bord Pleanála be consulted as it was believed that the proposed development may be considered strategic infrastructure.

The strategic infrastructure provisions of the Planning and Development (Strategic Infrastructure) Act 2006 (the 2006 Act) came into effect on 31st January 2007. The Act, which amends the Planning and Development Act 2000 (the 2000 Act), provides generally for applications for permission/approval for specified private and public strategic infrastructure developments to be made directly to the Board.

Part 18 of the Planning and Development Regulations 2006 (S.I. No. 685 of 2006) (the 2006 Regulations) relating to strategic infrastructure development (SID) also came into effect on 31st January 2007. The 2006 Regulations amend the Planning and Development Regulations 2001.

The proposed development at Lumcloon is listed in the 7th Schedule to the 2000 Act under the following:

- *A thermal power station or other combustion installation with a total energy output of 300 megawatts or more*

In accordance with Sections 37(A) and 37(B) of the Planning and Act, 2000, the applicant was obliged to enter into pre-application consultations with the Board to obtain clarification on whether or not the Board regard the proposed development as strategic infrastructure within one or more of the following parameters as listed in Section 37(A) (1):

a. the development would be of strategic economic or social importance to the State or the region in which it would be situate

b. the development would contribute substantially to the fulfilment of any of the objectives in the National Spatial Strategy or in any regional planning guidelines in force in respect of the area or areas in which it would be situate,

c. the development would have a significant effect on the area of more than one planning authority.

Pre-application consultation was undertaken with An Bord Pleanála. The process resulted in the Board considering the proposed development to be considered SID. A copy of the letter from An Bord Pleanála, dated 27th July 2009, is contained in Appendix 1.1, stating that the Board decided that the proposed development is strategic infrastructure within the meaning of Section 37A of the Planning and Development Act, 2000, as amended.

1.3.2 Environmental Impact Assessment

The obligations under Irish law in respect of EIA and EIS are derived from obligations incurred as a result of membership of the European Community. Prior to 2000, legislation governing EIA was contained in various EC directives, brought into force by the European Communities (EIA) Regulations, 1989 and the EC (EIA) (Amendment) Regulations, 1999 and the Local Government (Planning and Development) Regulations, 1999. These Regulations have now been largely consolidated within the terms of *Part X* of the 2000 Act and Part 10 and Schedules 5, 6, and 7 to the 2001 Regulations. Essentially the various regulations require an EIA to be conducted by the developer before consent is given for projects likely to have significant effects on the environment by reason of their size, nature or location.

The type of development for which an EIS is required, has now been clarified and modified by *Part X* of the 2000 Act and Part 10 of and Schedules 5, 6, and 7 to the 2001 Regulations. The development is subject to EIS under Schedule 5, Part 1, 2(a) of the Planning Regulations;

Schedule 5, Part 1, 2(a): *'A thermal power station or other combustion installation with a heat output of 300 megawatts or more'*

The development will also require an IPPC license under paragraph 2.1 of the new First Schedule of the EPA Act 1992, as amended by the Protection of the Environment Act, 2003.

Paragraph 2.1 'The production of energy in combustion plant the rated thermal input of which is equal to or greater than 50MW other than any such plant which makes direct use of the products of combustion in a manufacturing process.'

This EIS has been prepared in accordance with the Environmental Protection Agency (EPA) *'Guidelines on the Information to be contained in Environmental Impact Statements'* and also *'Advice Notes on Current Practice in the Preparation of Environmental Impact Statements'*, published in 2002 and 2003 respectively.

1.3.3 Electricity Regulatory System

This task of regulating electricity supply and demand is undertaken by the Transmission System Operator (TSO), who is appointed by the Electricity Regulator. The Commission for Electricity Regulation (CER) was assigned responsibility over the regulation of the Irish electricity market following the enactment of the Electricity Regulation Act 1999. When the ESB was the sole electricity company, they undertook the duty of TSO. After the law was changed to permit competition in the Irish Electricity Market, a new company Eirgrid was appointed as TSO by CER. Eirgrid projects and plans how much electricity is needed to supply customer demand through the year and buys this from companies licensed by CER to generate electricity. Eirgrid is also responsible for ensuring the high voltage transmission network has sufficient capacity to carry electricity to all parts of the country.

1.3.3.1 Commission for Energy Regulation (CER)

To connect to the electricity network, an applicant must hold an *Authorisation to Construct or Reconstruct a Generating Station* and a *Generator Licence*. The CER is the responsible body for assessing and for granting or refusing these permits. The conditions imposed in the authorisation and in the licence must be met by the generator and compliance is monitored by the CER on an ongoing basis.

Under Section 16 of the Electricity Regulation Act 1999, anyone wishing to construct a new generating station or reconstruct an existing generating station must obtain an authorisation from the CER prior to commencing work. The criteria used to assess an application for an authorisation are detailed in SI 309 of 1999.

Under Section 14 of the Electricity Regulation Act all generators must obtain a generation licence from the CER. The CER can consider a number of factors in evaluating a licence application. These may include, for example, the availability of sufficient appropriate financial, managerial or technical resources to ensure that the generator is able to comply with the terms and conditions that govern the electricity generation licence.

1.3.3.2 Eirgrid

Eirgrid is a state-owned company which is responsible for the provision of transmission and market services for Ireland. Eirgrid's primary roles are:

- To operate a safe, reliable, economical and efficient national electricity grid
- To plan and develop the grid infrastructure needed to support Ireland's economy
- To supervise the security of the national grid
- To schedule electricity generation with power generators and stations
- To facilitate the market for renewable electricity in Ireland

1.3.3.3 Health and Safety Authority (HSA)

The Health and Safety Authority (HSA) is the competent authority responsible for administration and enforcement of the European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2006 (S.I. No. 74 of 2006). The site proposed facility at Lumcloon has been designated lower tier status by the HSA.

There are a number of implications to these regulations for lower-tier sites. The first, and most imminent, is that you have to notify the Health & Safety Authority (specifically the Process Industries Unit, Health & Safety Authority, 10 Hogan Place, Dublin 2) and your local planning authority. The requirements under the Regulations are discussed further under Section 1.3.4.

1.3.3.4 Environmental Protection Agency (EPA)

The EPA licenses the operation of power generation plants under the integrated pollution prevention and control (IPPC) licensing system and each licence application is considered on its merits.

IPPC licences aim to prevent or reduce emissions to air, water and land, reduce waste and improve energy and resource usage. An IPPC licence is a single integrated licence which covers all emissions from the facility and environmental management.

The EPA has also responsibility for implementing the EU's Emissions Trading Scheme in Ireland, which is a policy measure targeted at large producers to reduce greenhouse gases such as carbon dioxide and incentivise energy efficiency of plants. The proposed facility will be required to comply with various legislation and international agreements as discussed in Section 1.3.4 below.

1.3.4 EU Directives and International Agreements

IPPC Directive (96/61/EC as amended by Directive 2003/87/EC

The installation falls within the scope of category 1.1 (Combustion installations with a rated thermal input exceeding 50MW) of Annex I of Council Directive 96/61/EC concerning integrated pollution prevention and control (IPPC). As a new activity the IPPC Directive requires that the competent authority take account of the general principles set out in Article 3 of the Directive when determining the conditions of a permit.

Best Available Technology (BAT) for gas turbines is detailed in Directive 2001/80/EC, which includes limitations on emissions of certain pollutants into the air from large combustion plant. In 2008 the EPA published a BAT Guidance Note on Best Available Techniques for the Energy Sector (Large Combustion Plant Sector) which is relevant to this development at Lumcloon.

Large Combustion Plant Directive (LCPD), 2001/80/EC

The Large Combustion Plant Directive 2001/80/EC, was transposed in Irish legislation under S.I. 644 of 2003. The Directive applies to combustion plants with a rated thermal input of equal to or greater than 50 MW, irrespective of the fuel used (solid, liquid or gaseous). The Directive focuses specifically on limiting the emissions of sulphur dioxide and nitrogen oxides from large combustion plants, including power plants.

Seveso Directive (96/82/EC and 2003/105/EC)

The European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2006 implements Council Directive 2003/105/EC (amending 96/82/EC) on the control of major accident hazards involving dangerous substances (also referred to as the 'Seveso 2' or COMAH Directive). They replace the EC (Control of Major Accident Hazards involving Dangerous Substances) Regulations, 2000 (SI 476 of 2000). The Regulations apply to establishments that present a major accident hazard by virtue of the presence of specified quantities of dangerous substances. The recently introduced 2008 Chemical Act (No. 13 of 2008) also provides for the making of Regulations to re-transpose the *'Seveso'* Directives and to replace the European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2006 (S.I. No. 74 of 2006).

The purpose of these Regulations is to ensure at establishments where dangerous substances are handled, a high level of protection is provided for people, property and the environment, through measures aimed at:

(i) the prevention of a major accident,

(ii) the use of any necessary measures to limit the consequences of such an accident, should it occur.

A *'major accident'* is defined in the Regulations as an occurrence such as a major emission, fire or explosion resulting from uncontrolled developments in the course of the operation of any establishment, leading to a serious danger either to human health or to the environment, whether immediate or delayed, inside or outside the establishment, and involving one or more dangerous substances.

To determine whether the Regulations apply to an establishment the criterion is whether those dangerous substances (listed in the first schedule to the Regulations) are present in quantities equal to or in excess of the thresholds set out in the schedule. If the inventory equals or is greater than that of column 3 (first schedule) it becomes 'upper-tier'. If it is less than this quantity but greater than the quantity in column 2 (first schedule), it becomes 'lower-tier'.

The proposed installation at Lumcloon will be a 'lower tier' Seveso site due to the storage of diesel (gas oil) as back-up fuel. The proposed storage volume exceed the threshold in column 2 (first schedule of the regulations) but is less than the threshold in column 3. All establishments under the Regulations have certain duties, depending on whether the establishment is classified as upper or lower tier. These duties are set out in Regulations 8-11 and consist of:

- Notification to the HSA and the local planning authority
- Discharging certain general duties
- Preparation and implementation of a major accident prevention policy
- Action in the event of a major accident
- Maintaining a register of notifiable incidents.

A major accidents hazard (MAH) report was requested by the HSA in accordance with Regulation 27(1) as part of the planning process to advise the planning authority on land use planning. This was prepared summary details are contained in Chapter 4, Human Beings. The full MAH report is contained in Appendix 4.1.

Kyoto Protocol

The Kyoto Protocol, which established greenhouse gas (GHG) emissions targets for industrialised countries, was agreed in 1997 following publication of the IPCC second assessment report. The Protocol came into force on 16 February 2005. Ireland has committed to limiting the increase in GHG emissions in the period 2008-2012 to 13 per cent above its 1990 levels. For the period beyond 2012, the EU Council of Ministers has recently committed to achieving at least a 20 per cent reduction of greenhouse gas emissions by 2020, compared to 1990 levels.

Total GHG emissions in Ireland in 2007 were 69.205 million tonnes carbon dioxide equivalent (Mt CO2e), which is 0.477 Mt CO2e (0.68 percent) lower than the level of emissions in 2006. Agriculture is the single largest contributor to the overall emissions, at 26.8% of the total, followed by Energy (power generation and oil refining) at 21.5% and Transport at 20.8%. The remainder is made up by the Residential sector at 10.2%, Industry and Commercial at 17.9%, and Waste at 2.8%

Emissions from Energy Industries, principally electricity generation, decreased from 15.529 Mt Mt CO2e in 2006 to 14.913 Mt CO2e in 2007, a decrease of 4.0 percent. Displacement of oil and coal by natural gas, which is a cleaner fuel, accounts for the majority of this decrease in emissions from this sector. Penetration of renewable energy sources such as wind has also contributed to the decrease.

Greenhouse Gas Emissions Trading Directive 2003/87/EC

The EU emissions trading scheme came into operation on 1 January 2005. The first phase ran from 2005-2007 and the second phase will run from 2008-2012 to coincide with the first Kyoto commitment period. Emissions Trading is a 'cap and trade' scheme where participating installations are given a fixed allocation each year and must either abate CO_2 emissions to that level or purchase allowances to meet any exceedance. It is designed to bring about reductions in emissions at lowest cost, and is seen to play an increasingly important role in assisting European industry implement the type of reductions envisaged in the EU Commission's 2008 Energy and Climate Package for a 20% overall reduction of GHG emissions by 2020 (relative to 1990 levels).

These proposals were set out in the EU Commission's 2008 Energy and Climate Package, agreed by EU Parliament and Council in December 2008. In the package, the total effort for greenhouse gas reductions by 2020 has been divided between the sectors covered by the EU Emissions Trading Scheme (ETS) and non-ETS sectors. For those sectors covered by the EU ETS, a single EU-wide cap has been agreed. Consequently, there are no specific national emissions targets for emissions from ETS sectors in 2020.

The Emissions Trading Scheme covers over 100 major industrial and institutional sites in Ireland. These include power generation, other combustion, cement, lime, glass and ceramic plants and oil refining. Also included are large companies in areas such as food and drink, pharmaceuticals and semi-conductors. It should be noted that the target for Ireland for non-ETS sector emissions under the 2008 package is to reduce emissions by 20% by 2020 relative to 2005 levels. The non-ETS sector consists of agriculture, transport, residential and other sectors.

Once Ireland's National Allocation Plan for 2008 – 2012 for the emissions trading sector was accepted by the EU Commission, the Environmental Protection Agency (EPA) decided on allocations of GHG emission allowances to Ireland's major GHG emitters, under the Emissions Trading Directive until 2012. Power generation accounts for two thirds of the available national allowances. In total, Ireland's emissions trading scheme companies emitted 20.38 MT CO_2e in 2008. This compares to a free allocation under Ireland's National Allocation Plan to these installations in 2008 of 19.97 million tonnes CO_2e (Article 10 of the Directive requires that at least 90% of the allowances be issued free of charge). New entrants to the scheme in the five-year period are catered for through a specific set aside (9%) of available allowances.

A gas CCGT plant will generate roughly 400g of CO_2 per kWh of electricity output. The figure for thermal gas plant would be roughly 650g/kWh. A thermal oil plant would be roughly 900g/kWh, while the equivalent figures for coal and peat are 850 and 1,500 g/kWh respectively.

The proposed facility at Lumcloon will use natural gas to generate electricity and will require a GHG Permit in accordance with the European Communities (Greenhouse Gas Emissions Trading) Regulations 2004, (S.I. 437 of 2004 and amendments). These permits are issued by the EPA prior to commencement of the activity.

National Emissions Ceiling (NEC) Directive 2001/81/EC

The EU Directive on National Emission Ceilings (2001/81/EC) specifies challenging aggregate national ceilings for four transboundary pollutants, which must be achieved by 2010. The four air pollutants concerned (sulphur dioxide, nitrogen oxides, ammonia and volatile organic compounds) contribute to acidification, eutrophication and ground level ozone.

Ireland has committed, along with other countries inside and outside the EU, to reducing emissions of these pollutants in addition to the GHG emissions reductions Ireland is committed to under the Kyoto Protocol. The Directive is transposed under the European Communities (National Emissions Ceilings) Regulations 2004, S.I. No. 10 of 2004.

The proposed development will support and provide the needed backup (peaking capability) to facilitate sustainable future penetration of wind generation plant in accordance with government renewable electricity targets, i.e. 15% by 2010 and 40% by 2020.

The proposed power generation plant at Lumcloon will use natural gas as it main fuel which is a cleaner fuel than coal or oil. The plant will be fitted with dry low NOx burners and by using natural gas as its primary fuel; the plant will have no sulphur dioxide emissions.

1.4 NEED FOR THE PROPOSED DEVELOPMENT

Electrical energy is an important factor in all aspects of our lives, including industry, agriculture, environment, and socio-economic in general. The government white paper entitled *'Delivering a Sustainable Energy Future for Ireland (Energy Policy Framework 2007 – 2020)'* sets out the Government's Energy Policy Framework to deliver a sustainable energy supply for Ireland. It is set firmly in the global and European context which has put energy security and climate change among the most urgent international challenges. The paper identifies security of energy supply as a primary objective for the economy and its development.

In November 2007, the Commission for Energy Regulation (CER) and Electricity Supply Board (ESB) signed the CER-ESB Asset Strategy Agreement. This strategy aims to ensure ESB's market share in power generation in Ireland is reduced to 40% by 2010. The strategy provides for the closure and sale of a number of ESB generation sites in order to make space for new independent generators.

A Single Electricity Market (SEM) was also established between Ireland and Northern Ireland in 2007. The key driver behind the establishment of the SEM is the promotion of wholesale competition between generators across Ireland and Northern Ireland and the associated benefits which this will bring for customers in both jurisdictions. The CER believes the market is proving successful in achieving this aim and it is attracting new generation capacity to enter the market. The SEM market is structured around a gross mandatory pool in which participation is compulsory for generators having a maximum export capacity in excess of 10MW.

The Government's Renewable Energy policy, reflecting the RES-E Directive of the European Parliament and Council (Directive 2001/77/EC), sets a target for Ireland of 15% of total electricity consumption from renewable sources by 2010, and 33% by 2020. The target for 2020 was increased to 40% in October 2008.

1.4.1 Flexible Generation Power Plants

In their generation adequacy assessment (GAR 2009-2015 Report), Eirgrid concluded that the balance between demand and supply is expected to be manageable up until 2011, at which point significant new generation capacity will be required. This is also contingent on no major plant failures in excess of existing outage trends, Great Island and Tarbert remaining operational until the end of winter of 2011/12 and Aghada and Whitegate CCGTs connecting as planned. It should also be noted that there is also plans for increasing the amount of new wind power generation capacity over the next number of years.

Following consultation, the CER set out a final direction (CER/08/260) in December 2008 to the system operators on Gate 3 of Ireland's network connection policy for renewable generators. In keeping with the Government target, this direction allows for 40% of Ireland's electricity consumption coming from renewable generation by 2020. It does so by providing for circa 3,900 MW of renewable generator connection offers in Gate 3. The total capacity of conventional generation, as well as interconnection capacity, assumed for 2025 is outlined in Table 1.1 below and the figures match up to a 40% renewable penetration level (i.e. 6,494MW).

Table 1.1 2025 Capacity Requirement of Conventional Generation Plants

Type	Size	Number	Total
Base	500	8	4,000
Mid Merit	350	8	2,800
Peaking	100	16	1,600
CHP	100	4	400
Interconnectors	500	3	1,500

Source CER/08/260

The Regulatory Authorities, CER and Northern Ireland Authority for Utility Regulation (NIAUR), published a study in January 2009 to access the impact of increasing wind penetration on the island of Ireland on the ability of the Single Electricity Market (SEM). The results of the study suggest that increased renewable generation will have a significant impact on the operation of installed thermal generation capacity. In particular, existing baseload CCGTs will move into the mid-merit segment of the market and thereby see a sharp reduction in their capacity factors. Coal generation stations will also see a marked reduction in capacity factors. The number of unit starts of thermal stations is also likely to increase significantly, with implications for recurring maintenance costs and plant life.

The proposed power plant at Lumcloon compliments that outlined for *Mid Merit* type plant. Mid-merit units are modern, efficient power plants that can come on-line quickly in response to increases in the demand for power. The flexible generation plant proposed will be required to operate at high efficiency when demand is high and reduce output to lower levels at times when demand is low, having the plant on standby or spinning reserve mode, but with the ability to rapidly increase output.

The impact of an increased percentage of electricity coming from wind results in the need for increased levels of flexible plant to compensate for the variations in output from wind. Specifically, fast-acting and flexible dispatchable generation plants are required to provide back-up so that system stability can be maintained when the wind levels are low (or too high). Hence, Ireland's electricity generation portfolio needs to have sufficient flexible units (for example with sufficient ramp up and down rates as well as low start-up times) to be able to function at all times under extreme meteorological conditions.

The proposed plant will be capable of supporting up to 5% of installed wind capacity as well as a spinning reserve capacity having the characteristics to respond instantly to grid frequency degeneration.

Although the expected large growth of installed renewable capacity will increase portfolio diversity, it will only offer a limited contribution to generation adequacy and there will be need for conventional type plant to ensure adequacy of supply. It is also recognised that that proposed electrification of the transport sector (10% of national car fleet by 2020) will increase demand to that projected and alter the demand profile in future years.

Significant reliable flexible generation capacity is required to meet increased demand and any shortfall of capacity resulting from the closure of a number of older generating units and to offer capacity and availability in the system to accommodate wind generation.

1.4.1.1 Wind Power Generation

Wind power generation in Ireland is expected to be the major contributor to the 15% 2010 renewable target. This 15% target can be achieved with about 1,350 MW of wind power generation installed by 2010. In December 2008, the CER published its final direction for renewable operations on Gate 3. The direction provides for the 40% renewable target value by including circa 3,900MW of renewable generator projects in Gate 3.

If 40% of electrical consumption is met by renewable generation, it follows that 60% must be supplied from non-renewable 'conventional' generation or imports from abroad. Given that wind is expected to make up most of the renewable portfolio, the amount of conventional generation capacity must be adequate to ensure a reliable power supply for those hours when wind generation output is low. As the contribution from wind will be very low under specific meteorological conditions, we effectively need flexible and reliable plant capable of quick start up and with equivalent output levels to that which would be generated by wind

As more wind generation connects to the system, additional flexible plant are required to ramp-up and down quickly to maintain an adequate security of supply. Therefore the proposed flexible plant will be required to operate at high efficiency in the middle hours of the day when demand is elevated, and to reduce output to minimum stable generation or shut down at night depending on the output from wind.

1.4.2 Forecast and Demand

1.4.2.1 Forecast

The economic development experienced in Ireland over the past few years has contributed to the significant growth in demand on the Irish electricity system. The relationship between economic growth and electricity consumption is long established. However in the future, the rate of increase is not expected to continue at levels recently experienced. This is evident in the annual rate of increase of the total electricity requirement, which has averaged 3.9% per annum for the period 2002 to 2007. The median forecast for average growth between 2009 and 2015 is 2.6% and the average growth for the high demand forecast over this period is 3.3%. The average peak growth in the median demand case over 2009-2015 is forecasted at approximately 2.5%.

Table 1.2 presents the forecasts of transmission demand for the five years 2008 to 2015. These correspond to the median demand forecasts in Eirgrid's Generation Adequacy Report 2009-2015, which are calculated based on ESRI forecasts of economic activity. Total electricity requirement (TER) values, are presented for each year along with TER growth percentage.

Table 1.2 Transmission Peak Demand Forecasts, MW

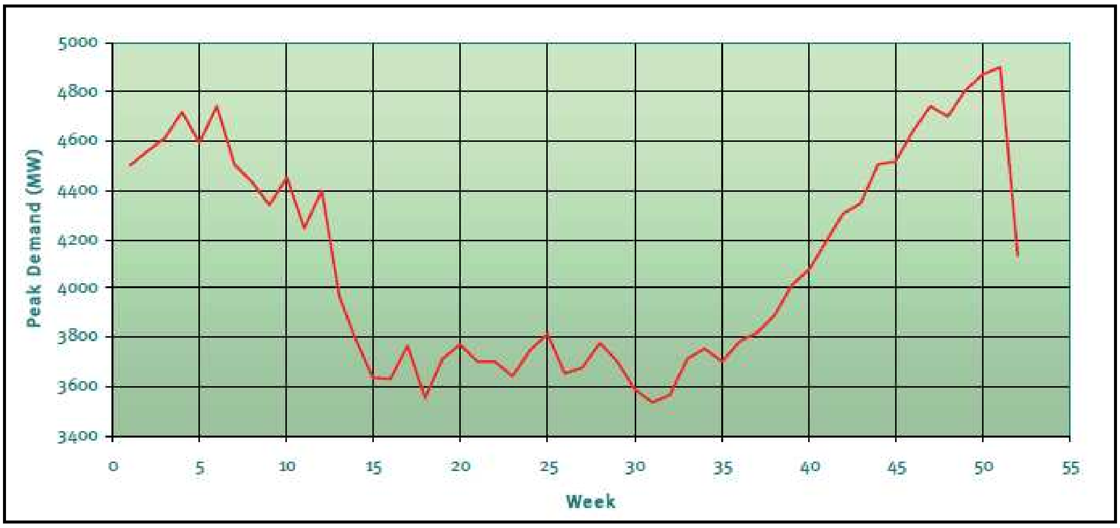
Year	TER Peak (MW)	TER Growth
2008	4,990	2.1%
2009	5,085	2.1%
2010	5,181	2.1%
2011	5,315	2.8%
2012	5,457	2.8%
2013	5,606	2.9%
2014	5,759	2.9%
2015	5,908	2.7%

The above figures show that a secure and reliable energy supply at competitive cost is critical for Ireland's ability to retain and attract foreign direct investment and for the competitiveness of all sectors of Irish enterprise. It is recognised by government, that increased competition and investment in the power generation sector will deliver better performance and operational efficiencies putting downward pressure on wholesale electricity prices and improving security of supply.

1.4.2.2 Demand

Electricity usage in Ireland follows some generally accepted patterns. Figure 1.3 illustrates weekly peak demand values during 2007. The annual peak demand for electricity follows established usage patterns and occurs between 17.00 and 19.00 on winter weekday evenings, while minimum usage occurs during summer weekend night-time hours. As can be seen from the graph electricity demand is at its peak in the winter months, when the days are short and the weather is colder.

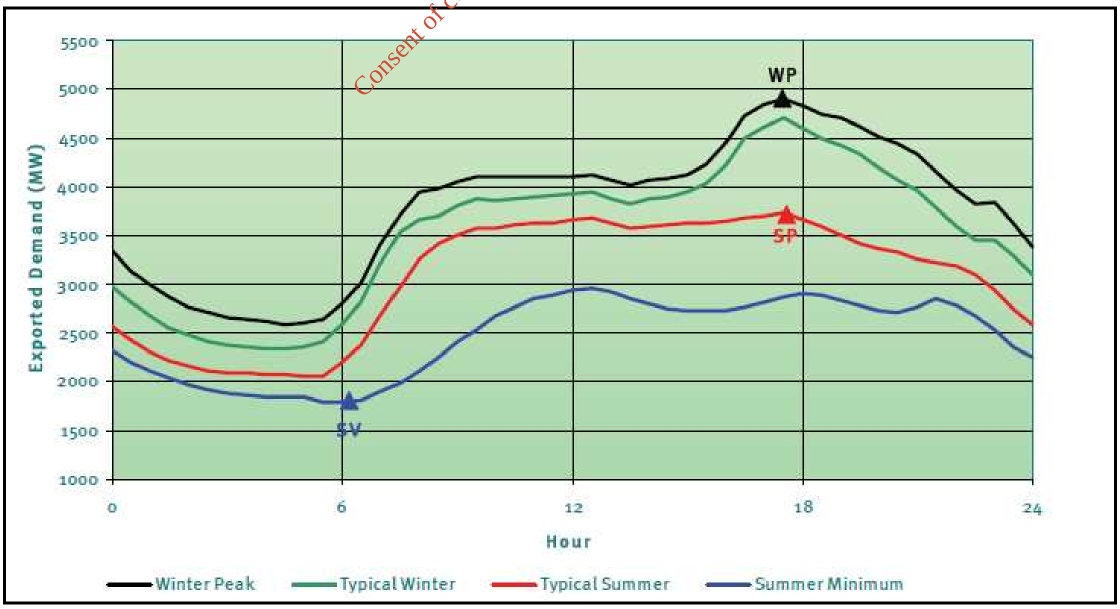
Figure 1.3 Weekly Peak Values for 2007



Source: Eirgrid Transmission Forecast Statement 2008-2014

Daily demand profiles also vary considerably throughout the day. Analysis of demand profiles undertaken by Eirgrid for the 2007 annual period, show levels ranging from approximately 1,787 MW to 4,902 MW. These annual and daily demand profiles demonstrate that the power system deals with a wide variation in demand throughout the year that the day demand variations are substantial. Daily demand profiles from 2007 usage figures are illustrated in Figure 1.4 below. The winter peak (WP), typical summer peak (SP) and summer valley (SV) demands are shown on the graph.

Figure 1.4 Daily Demand Profile for 2007



Source: Eirgrid Transmission Forecast Statement 2008-2014

At the beginning of 2008, Ireland had some 7,188 MW (net) of installed capacity. This figure however does not however consider system generation availability. Installed generation capacity reduces to between 75 and 82% (based on Eirgrid data taken from 2006 to present) of total capacity when generation system outages (forced and committed) are taken into account. The figure is further reduced when wind generation is considered since maximum wind generation output is limited by meteorological conditions. A generation portfolio which includes wind has a greater total installed generation capacity than a system which has no wind, as 1 MW of wind does not offer the same contribution towards generation adequacy as 1 MW of conventional plant. This is an important factor in forecasting as Ireland has committed to 6,494MW renewables penetration by 2025.

In should also be noted that in their strategy document (*Grid 25)* for the Development of Ireland's Electricity Grid for a Sustainable and Competitive Future, Eirgrid predicts that the demand for electricity in the Midlands region will grow by over 40% by 2025. Therefore it is essential that sufficient and suitable conventional generation is planned and provided for to ensure that energy is consistently available at competitive prices with minimal risk of supply disruption. This is the primary objective as outlined in the 2007 Energy White paper entitled *'Delivering a Sustainable Energy Future for Ireland'.*

1.5 ALTERNATIVES

Schedule 6 of the Planning and Development Regulations, 2001, sets out the mandatory information that must be contained in an Environmental Impact Statement. Item 1(d) requires:

> *'An **outline** of the **main alternatives** studied by the developer and an **indication** of the **main reasons** for his or her choice, taking into account the effects on the environment.'*

It is noted that the Regulations do not use the word 'site'.

Guidelines on the Information to be contained in Environmental Impact Statements, EPA 2002, (Section 2.4.3) provide the following guidance in relation to the examination of alternatives.

> *"The consideration of alternative routes, **sites**, alignments, **layouts, processes, designs or strategies**, is the single most effective means of avoiding environmental impacts. The acceptability and credibility of EIA findings can be significantly affected by the extent to which this issue is addressed".*

"...for major infrastructure projects the intrinsic suitability of the site is the principal amelioration strategy".

...It is important... to acknowledge (that) other non-environmental factors may have ***equal or overriding importance*** *to the developer e.g.* ***project economics, land availability****, engineering feasibility, planning considerations."*

"The consideration of alternatives also needs to be set within the parameters of **availability of land** (**it may be the only suitable land available to the developer**) or the need for the project to accommodate demands or opportunities which are site specific. **Such considerations should be on the basis of alternatives within a site e.g. design, layout**.

1.5.1 Alternative Locations

The 2002 EPA Guidelines are significant and relevant to the proposed development in the following material respects:

- The guidelines explicitly state that project economics and land availability are identified as criteria which may be of over-riding importance. Adding to this the availability of suitable development lands in close proximity to the existing gas grid network and electricity transmission network is a key factor in considering and determining a suitable site location for this development
- The availability of land is a material consideration in assessing the consideration of alternatives. The proposed development took cognisance of planning and development policy prescribed in the National Spatial Strategy (NSS) and Offaly County Development Plan which requires priority be given to the regeneration of disused brownfield sites ahead of greenfield development.
- Consideration of historical industrial activity was a significant factor in the site selection process
- The proximity of the proposed development in relation to large population centres is a material consideration in the assessment and consideration of alternatives sites. As the development is categorised as lower tier COMAH (SEVESO), the Health and Safety Authority (HSA) require preparation of a risk and consequence assessment to be in accordance with the HSA guidance document entitled *'Setting the Specified Area – The HSA Approach'* related to the COMAH Regulations 2006, S.I. No. 74 of 2006. Therefore

ideally, COMAH designated facilities should not be located adjacent to densely populated areas

- Alternatives were also considered at the levels of site, processes, design and layout

In the site selection process for a power plant it is necessary to carefully consider not only the technical issues, but also its impact on natural environment, economy and near local communities.

1.5.1.1 Consideration of Sites for Generation

The Lumcloon Energy principals have for some time been actively engaged, individually and collectively, in the pursuit of an opportunity to develop a power plant in the Republic of Ireland since the publication of the European Union Directive on the deregulation of the electricity sector in 1998.

At this time it was then presumed that ESB, the vertically integrated company and the sole producer and trader of electricity, would be obliged to divest itself of a significant proportion of their generating capacity and particularly plant with little or no remnant life, thereby making brown field sites available to potential independent power developers interested in entering the electricity wholesale market. This however did not materialise at that time due to the relative small size of the market in Ireland.

A site in Drumcar, Co. Louth was conditionally acquired by Terotech International Ltd. at the time, which was within reasonable distance of a gas and electricity connection point. Environmental considerations were examined, found to be favourable and potential impacts were perceived to be low from preliminary studies. The project was abandoned after a prolonged period of feasibility analysis which included extensive market research. Regrettably, the results were not adequate to justify the project, as the plant would have to be classified as *'merchant plant'* for which an economic revenue stream was indeterminate as a result of the limited trading system that was operational at the time. A second site near the 400kv substation at Dunstown, Co. Kildare and close to the gas line was subsequently investigated and was likewise abandoned for similar reasons.

Subsequently a market system based on bilateral contracts for a small predetermined portion of the total country demand was put in place. The system in isolation offered little incentive to investors and not a single facility materialised until the introduction of the SEM in more recent years. The new system (CER-ESB Strategy, 2007) required the ESB to divest of some of their older plants and reduce their share in the Irish power generation market by 2010.

Therefore the opportunity for further attempts to enter the market did not materialise for the Lumcloon Energy partners until 2008. More favourable conditions relating to a brown-field site in proximity to services became available through decommissioned sites owned by the ESB. R and R Mechanical Ltd submitted a prequalification tender for sites at Great Island, Tarbert, Shannonbridge and Lanesboro, but was unsuccessful in its bids.

The brownfield site at the old Ferbane power plant, which was completely demolished in 2004, came on the market in 2008 for which R and R Mechanical Ltd tendered and were successful in acquiring the site. The site meets all the technical and financial requirements for the development of a modern gas turbine based thermal power plant. Prior to selling the site, the ESB received planning permission in 2004 from Offaly County Council for a 100 MW simple cycle gas turbine power plant at the proposed development site.

The proposed development site at Lumcloon has access to grid connection for a power plant in excess of 300MWs by the confluence of four 110kv three phase transmission lines at the site. A gas pipe connection is available within 20 kilometres of the proposed plant. The site is well serviced with accessible roadways, water sources, waste disposal facilities and other necessary amenities as existed during the construction and operation of the previous peat fired power plant located at the site.

1.5.1.2 Assessment of Alternative Site in the Midlands

Once the former ESB power station site in Lumcloon had been identified as potentially suitable, an appraisal of other sites within the midlands of Ireland (Athlone-Tullamore-Mullingar gateway) was undertaken. The following sites within the midlands region were identified as sites which could be suitable for the proposed development:

1. Ferbane Business and Technology Park ITM Ref 612638 724974
2. IDA Business Park, Athlone ITM Ref 606596 740091
3. IDA Business and Technology Park, Srah, Tullamore ITM Ref 632693 725935

All three alternative sites are zoned for industrial use and are in close proximity to the gas (i.e. within 20km kilometres of the gas network) and high voltage electricity grid. Four sites were assessed following consideration of local and national planning and development policy. The sites at Ferbane, Athlone, and Tullamore are zoned for industrial use, but are not owned by the applicant. The site at Lumcloon is located on part of the fully decommissioned former ESB owned power station site and is considered brownfield. Table 1.3 outlines an assessment matrix. The four sites are scored relative to each other against the assessment criteria and the scores are subsequently aggregated to identify the most suitable site for location of a 350MW gas power plant. All site locations considered and assessed at both national (Louth and Kildare) and regional (Midlands) levels are illustrated on Figure 1.5.

Table 1.3 Site Suitability Matrix

	Lumcloon	Ferbane	Athlone	Tullamore
General Assessment Criteria for Location of Power Plants				
History of Power Generation	4	1	1	1
Adequate supply of water	4	4	4	4
Proximity to the electricity network (high voltage), including connection	4	3	2	3
Proximity to the gas network (high pressure) <20km	4	4	4	4
Low population density	4	3	1	2
Land availability and ownership	4	3	3	3
Total	**24**	**18**	**15**	**17**
Site Specific Assessment Criteria				
Proximity to neighbouring occupied properties	4	2	1	2
Existing Ground Conditions	4	1	4	3
Brownfield Site	4	1	3	1
Traffic and Access	4	2	4	4
Visual	2	2	3	3
Total	**18**	**9**	**15**	**12**

Note:
4 High Weighting
3 High Medium Weighting
2 Low Medium Weighting
1 Low Weighting

As can be seen from Table 1.3, the proposed development site at Lumcloon is believed to be the most suitable for development of a new gas fired power plant. The site fulfils many of the assessment criteria. In key determining factors are summarised as follows:

The site is brownfield with a history of power generation

- Adjacent to an electricity grid connection as the former four transmission lines to Shannonbridge (2 no.), Thurles, and Portlaoise still exist on the site. The site is approx 10km north of the 400kv line which runs across the country from west to east – See Figure 1.5

- Close to a gas network (<20km) – See Figure 1.5
- Preliminary environmental assessments have not shown any reason why the brownfield site could not be redeveloped for power generation purposes and this is concluded in the contamination assessment and exit audit reports prepared for the site on behalf of the ESB
- Located at a weak generation point on the grid
- Capable of meeting the demands outlined in the Eirgrid 2009-2025 forecasts
- Social benefits to the area including employment generation
- History of power generation in the local community – improves acceptability by the local community
- The site is accessible by regional road with no requirement for construction of roads to access the proposed location
- Low population density in the vicinity of the site
- There is adequate water supply at the site – existing well on site used for abstraction during peat plant operation. Abstraction volumes were believed to be four times greater than that required by the proposed development.
- The site is located adjacent to Silver River and there is no requirement to construct and route a pipeline for wastewater discharge purposes. It is proposed to discharge treated effluent to the river. The River is believed to have good assimilative capacity from preliminary assessments
- The site is adequate in size to locate the type and size of flexible gas power plant required to meet the generation needs.

Locating the development at Lumcloon will also address certain key issues and challenges as identified in County and Regional Development Plans prepared within and for the Midlands region. Targeting and prioritising specific critical infrastructural projects (including energy) will facilitate positive economic development and help sustain rural communities.

1.5.2 Alternative Designs and Processes

The development of electricity as a universal source of power was facilitated by the technological achievement of previous centuries in the discovery and harnessing of electro-magnetic induction leading to electricity production in alternating current form. This allowed for the generation, transformation and transmission/distribution of electric power to consumers over wires and cables at various elevated voltages with minimum losses nationwide.

The main drawback with alternative current (AC) is that it cannot be stored directly and supply and demand must be matched instantaneously. The requirement to maintain the system frequency at a stable level (50 hertz in Ireland) is essential to avoid serious damage to equipment at the consumer end of the process as well as at he production and transportation ends. This is achieved by a range of equipment including voltage, current, power-factor, frequency and phase metering and controls.

Where the frequency fall below 50 hertz the operational procedures include the following:

- Load shedding manually or automatically. This is a costly exercise for producers and consumers
- Automatic use of spare capacity of machines in spinning reserve mode. This is achieved by the response of the generation plant in spinning reserve mode to changes in frequency affected through the operation of the speed regulatory devices on the machine. It is the most effective and economical method. In general the level of spinning reserve on the system should be equivalent to the size of the largest machine and in the case of Ireland it is of the order of 415mws, which is approximately 8.1% of peak demand

Therefore during the alterative assessment process, alternative designs were considered in the context of:

- National and Regional Requirements
- System Operator Requirements
- Suitability of Plant Types to the Preferred Site at Lumcloon
- Efficiency of Plant
- Flexibility of Plant
- Proven technologies
- Availability
- Flexibility
- Suitability to the selected site

The alternative design assessment process concluded that a 350MW output plant would be the most suitable and it should be flexible to meet fall off in wind energy generation plants. Following a comprehensive assessment, Lumcloon Energy considered in detail two scheme layouts for the proposed development. These are as follows:

Option A The power plant would be constructed as two power blocks (one combined cycle block and one simple cycle (peaking unit). The anticipated total capacity of both generating units would be 344MW output. The combined cycle block would be in a 2-2-1 configuration, i.e. two gas turbines, two heat recovery steam generator (HRSG) units and one steam turbine and all supporting auxiliary and ancillary plant. This would provide a net output of approximately 244MW.

The second power clock comprise an open cycle gas turbine (OCGT) consisting of one gas turbine with a capacity of approximately 100MW. This plant would be capable of being ramped-up in the event of fall off from power produced from wind energy plants. A preliminary site layout plan for Option A is contained in Figure 1.6.

Option B The power plant would be constructed as one power block capable of being operated in either single or combined cycle modes, depending on the electricity demand. The anticipated total capacity for the entire plant would be approximately 325MW output with supplementary firing. The power block would be in 4-4-2 configuration, i.e. four gas turbines, four HRSG units, two steam turbines and supporting auxiliary and ancillary plant. A preliminary site layout plan for Option A is contained in Figure 1.7.

One of the primary considerations in determining the plant type was flexibility, i.e., plant designed with the capability of fast start up and the ability to adjust load output quickly and predictably to changing market requirements. High operational flexibility and availability are seen as essential prerequisites to ensure economic success of a plant in a liberalised market.

The principle feature of Option B plant design is that it is capable of accommodating a wind power loss in the range from 47 to 188MW in open cycle mode and could generate 3MW per minute to its maximum load in 10 minutes in supplementary firing mode. Supplementary-fired HRSGs involves further combustion of additional fuel in the gas turbine exhaust gas by utilising duct burners. The result of this additional firing being that the flue gas temperature is substantially increased which in turn improves steam production and raises superheated steam temperature. This

The use of supplementary firing will provide a form of spinning reserve which involves little capital cost and has an instant response to system demand, i.e. temporary increase for peak loads. Spinning reserve can be defined as the unused capacity which can be activated on decision of the transmission system operator and which is provided by devices which are synchronised to the network and able to affect the active power. These devices help maintain the security and the quality of the supply of electricity. In particular, control of the frequency requires that a certain amount of active power be kept in reserve to be able to re-establish the balance between load and generation at all times

Option B was determined to be the preferred general plant design as it is one which, because of its configuration, provides for high reliability and flexibility and has a focus on simplicity and robustness.

Following consideration of gas turbine configurations, it was decided to design a generation plant with four small scale (50MW) gas turbines, instead of for example one larger turbine. This automatically heightens the availability of output, since it reduces the likelihood of the whole plant being rendered unavailable. It is proposed to install conventional drum design steam generators. Drum type boiler design is proven, efficient, flexible and reliable. Once through steam generator (OTSG) units were considered as an alternative and although the design has existed for many years they are still perceived as being novel with a higher risk than the conventional drum design. This is especially true in Europe where there is little reference plant. Additionally it should be noted that even though OTSG design does not require bypass ducts, the absence of bypass ducts means that gas turbines must be shut down in order to carry out maintenance on the HRSG system. This therefore would result in reduction in the flexibility of the proposed plant. In terms of a suitable cooling system, it is proposed to installed air cooled condenser (ACC) units. The advantage of ACC systems over wet cooling systems are that water usage requirements are minimal and there no issues associated with blowdown disposal and plume formation. Wet cooling systems also present potential difficulties in terms of thermal discharges.

In accordance with the requirements of the 2008 BAT Guidance Note for the Energy Sector (Large Combustion Plant Sector), the gas turbines will use dry low emissions technology. Dry abatement will eliminate the need for production and storage of large quantities of demineralised water for emissions control purposes. It will also significantly reduce the quantity of process wastewater (demineralisation process and wet scrubbing process) produced at the facility during its operation. Dry abatement reduces emissions without reducing efficiency of the plant. Particulate and sulphur dioxide emissions from gas-fired plant are very low and control measures are generally not required.

1.6 CONNECTION TO THE ELECTRICITY GRID AND GAS NETWORK

Connections to both the electricity and gas networks are not covered under this planning application. EirGrid, as TSO, operates a standard process for providing connection offers to parties seeking connection to the transmission system.

At the time of completion of the EIS, a grid connection application has been made by Lumcloon Energy within Gate 3. The application (node reference No. P187) has been assigned a new 220kV node looped into the Maynooth-Shannonbridge 200kV line. Power generated from the plant will be exported into the grid via the existing transmission lines located adjacent to the western boundary of the site.

It is anticipated that the length of the pipeline to connect the proposed development to the gas network at Ories, Athlone, Co Westmeath is below the threshold. The gas will enter the site at the above ground installation from the network, where it will be reduced prior to it being used at the facility.

In April 2006, the CER approved the Bord Gáis Networks Connection Policy Document regulating charges for customers connecting to the distribution and transmission pipeline systems. This policy document was again revised in June 2008. Connection charges imposed by An Bord Gáis for large Industrial and Commercial (I&C) customers now cover engineering costs associated with developing a new pipeline. A letter of agreement is signed between the developer and Gaslink (the independent system operator with responsibility for developing, maintaining and operating the natural gas transportation system in Ireland). Following detailed design, the developer is given a final cost for pipeline. It is normal practice that An Bord Gáis Networks then constructs the pipeline. If the pipeline is less than 20 kilometres in length and there are no associated above ground works, then there is no requirement to apply to local authority for planning permission. It is believed that the pipeline route from the gas network at Ories, near Athlone to the site in Lumcloon will be less than 20km. An Bord Gáis Networks would then apply to the CER for a licence to construct the proposed pipeline. This also requires preparation of an EIS or environmental reports to assess potential impacts to environmental aspects associated with its development.

It is normal practice for developers to first apply and receive planning permission from the planning authority for the power generation plant before commencing the gas connection process from the network to the AGI. This is due to the fact that the gas connection process involves significant costs and the decision to proceed with this process before obtaining planning consent would not be practical or financially sound.

1.7 ENVIRONMENTAL IMPACT STATEMENT METHODOLOGY

1.7.1 EIS Format

The EIS is presented in the *'Grouped Format Structure'* as set down in the EPA's *'Guidelines on Information to be Contained in an EIS'* produced by the Environmental Protection Agency (March 2002). In general, EIS the framework presented in the EPA Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (September 2003).

Under the EIA Regulations an EIS will contain the following:

Description of the proposed development

- site, design and size of the proposed development
- outline of main alternatives studied by developer
- nature and quantity of materials to be used
- physical characteristics of the development and land-use requirements during construction and operation

Description of the existing environment

- human beings
- flora and fauna
- soil and water (including soil/ geology, surface water and hydrogeology)
- air and noise
- climatic factors and the landscape
- material assets (including roads and traffic) and cultural heritage
- The inter-relationship between the above factors.

Description of the likely significant impacts

- the existence of the proposed development
- residues from the proposed development
- emissions from the proposed development
- aspects of the environment to be affected by the proposed development
- the use of natural resources

- the emission of pollutants
- the creation of nuisances

Description of the mitigation measures

Measures envisaged avoiding, reducing and if possible remedying those effects on each environmental aspect

1.7.2 Contributors to the EIS

The EIS was managed and collated by WYG Ireland Ltd. The contributors to the Statement are as follows:

Project Development and Description	Lumcloon Energy Ltd. and WYG Ireland Ltd.
Air Quality	WYG Ireland Ltd.
Climate	WYG Ireland Ltd.
Construction	WYG Ireland Ltd.
Archaeological, Architectural and Cultural Heritage	Cultural Resource Development Services Ltd.
Flora and Fauna	WYG Ireland Ltd.
Human Beings	WYG Ireland Ltd.
Noise	WYG Ireland Ltd.
Roads and Traffic	WYG Ireland Ltd.
Soils and Geology	WYG Ireland Ltd.
Groundwater	WYG Ireland Ltd.
Hydrology	WYG Ireland Ltd.
Landscape and Visual Appraisal	Park Hood Landscape Architects Ltd.
Material Assets	WYG Ireland Ltd.
Orchestration of Statement	WYG Ireland Ltd.
Planning Issues	WYG Ireland Ltd.
Interactions	All Specialists

In addition to the main contributors to the EIS, a number of organisations were engaged or referenced to provide data that was included in the EIS including meteorological, laboratory analysis, survey maps, aerial photography and geological/ hydrogeological information.

1.8 SCOPING

In order to identify the issues that needed to be addressed in the EIS, a Scoping Study was undertaken which included the following:

- Site reconnaissance and baseline surveys
- Visit to EPA offices in Wexford to review documents associated with ESB IPPC licence Application Reg. No. 695 – 100MW Gas Turbine generation plant at Lumcloon, Cloghan, Ferbane, Co. Offaly.
- Review of Ground Contamination and Exit Audit Reports prepared for the ESB owned site at Lumcloon, Cloghan, Ferbane, Co. Offaly
- Public Consultation with Local Community
- Written consultation to Prescribed Bodies
- Consultation Meeting with Offaly County Council Planning Department (Summary details are contained in Table 1.4)
- Pre Application Consultation Meetings with An Bord Pleanála (Summary details are contained in Table 1.4 and Records of meetings are attached in Appendix 1.2)

1.8.1 Site Reconnaissance and Baseline Surveys

Each specialist visited the site between January and June 2009 and completed baseline assessment works. The scope of baseline assessment works undertaken is discussed separately within each assessment chapter.

1.8.2 Review of ESB IPPC Application - Reg. No. 695

WYG undertook a review of the ESB IPPC application for the gas powered peaking plant which was grated planning permission by Offaly Council in 2004.

ESB proposed to install up to four Gas Turbine generators (dependent on the plant option chosen) on the site of the now decommissioned peat fired power station. The plant was intended to cater for peaks in electricity demand, mainly evening peaks during the winter months, until 2008. It was proposed to have the plant on standby throughout the year as it may be required to cover maintenance outages at other plant.

Two plant options were under consideration. One option consisted of four identical turbines, with a total rated electrical output of approximately 92MWe. The other option consisted of two 'Twinpac' turbines, each comprising two combustion turbines driving a common generator. The total rated electrical output of the Twinpacs was approximately 104MWe.

The development would also have involved the provision of a water treatment plant (ion exchange) on site, two steel storage tanks, one for gasoil, and the other for demineralised water storage. It was proposed to reuse two small tanks on site for fuel storage and two transformers would also have been installed.

ESB were granted permission to construct the development in 2004 by Offaly County Council but subsequently decided not to proceed with the development and as a consequence offered the site at Lumcloon for sale.

1.8.3 Review of Ground Contamination Reports

The following is a summary of the findings of the environmental exit audits undertaken (between 2005 and 2008) by the ESB for the former ESB owned peat power station at Lumcloon, Cloghan, Ferbane, Co. Offaly, hereinafter referred to as '*the former ESB owned power site*'). A more detailed review is provided in Chapter 7 of the EIS, Soils and Geology. It should be noted that the reports present findings for assessments undertaken on all lands within the boundary of the former ESB owned power site. Lumcloon Energy only acquired part (i.e. 11 acres) of the former ESB owned power site and proposes to develop the gas fired power station on these lands. The proposed development site contained the peat power plant infrastructure, i.e. cooling towers, plant buildings, ancillary and auxiliary plant.

A report on Phase 1 of the exit audit process reported that asbestos containing materials (ACM) had been detected in the station dump area (ash field) which is located 450m south east of the proposed development site boundary. Remediation work has been undertaken and the ACM removed. The Phase 1 report also indicated that the soils at the site had the potential to be impacted by oil or chemical spills within the station site.

Phase 2 assessment works included a site investigation (SI) which was undertaken in 2004 across the full former site. The SI found frequent low-level contamination by a number of metals which was attributed to the presence of peat ash disposed in the ash field south east of the proposed site boundary. Localised low-level contamination by a number of other metals and phenol was also reported in the shallow soils at the site. This was attributed to materials deposited during station activities or site demolition. It was concluded that the risk to human health from the observed contamination was low.

Low-level hydrocarbon contamination was found in near-surface soils in the location of the former transformer bays. An area of more elevated hydrocarbon contamination was identified in the electrical compound which borders the south west boundary of the proposed site. It was concluded that the hydrocarbon contamination encountered was unlikely to have an impact upon the local environment.

Surface waters within the site were generally uncontaminated; low-level contamination by some parameters (molybdenum, and sulphate) was noted in the surface waters associated with the ash field. No impact on the Silver River by station activities at the former power station was identified.

Groundwater at the site was found to be contaminated with ammoniacal nitrogen and total coliforms. This contamination was thought to be attributable to past station activities. Localised groundwater contamination was encountered close to the water treatment lagoon which is located towards the north east corner of the proposed site (manganese and nitrate); and close to the former station dump (arsenic and nickel). It was concluded that contamination of the groundwater was unlikely to have any significant impact upon the local environment.

The conclusions from Phase 2 of the exit audit are as follows:

- ESB has taken all reasonable steps to locate and remove any asbestos buried at the station dump during their ownership;
- The SI confirmed that the former ESB owned power site is asbestos safe; and in terms of asbestos the site is suitable for future commercial, industrial, or residential use;
- The SI did not encounter any organic contamination by mineral oil, PAHs or PCBs at the site
- Some elevated metals were encountered in the waste materials at the site, however it was concluded that they do not pose a significant risk to the current site users and are not expected to preclude redevelopment of the area.
- The low-level localised hydrocarbon contamination identified in the shallow soil in the electrical compound will need to be excavated for off site disposal

1.8.4 Local Community Consultation

Lumcloon Energy consulted with the local community in September 2008 and in June 2009. The purpose of local community consultation process was to:

- inform the local community about the proposed development,

- ensure that all residents are kept informed of all proposals,
- highlight the economic benefit of the development, and
- strengthen relationships and build rapport between Lumcloon Energy and the local community residents.

Signed letters of support were obtained from local community residents in September 2008 and these are contained in Appendix 1.3 attached. Lumcloon Energy also conducted a public information meeting regarding the Environmental Impact Study for this project on Monday 29th June at Lumcloon Primary School. All attendees signed a register of attendance. The format of the information meeting was one of open forum where attendees were invited to put their questions in relation to the proposed development to Lumcloon Energy representatives. A continuous digital presentation providing information on the project was also displayed throughout the meeting.

Feedback from participants was facilitated three ways:

- Note taking of questions and comments throughout the meeting
- Each participant had an opportunity to provide their comments on the attendance register
- The attendees were invited to telephone or email Lumcloon Energy with any questions or observations

A commitment to conduct future information meetings was also made to keep the local community informed during the planning process.

1.8.5 Consultation with Statutory Bodies and Stakeholders

Written and telephone consultations was undertaken with statutory bodies and relevant stakeholders. All written responses received are contained in Appendix 1.4. All comments received were considered in length and are addressed within the EIS. A Scoping Report was prepared and submitted to An Bord Pleanála on 3rd June 2009 for information purposes. A final meeting was then held by An Bord Pleanála on 17th June 2009, at which the Board provided it's considerations in relation to the proposed development and outlined the procedure for making an application. A summary of responses and meetings undertaken during the pre-application consultation process is outlined in Table 1.4 below.

Table 1.4 Summaries of Responses to Consultation Process

Body	Response Received	Date	Summary of Comments
All Assessments			
Offaly Co. Co (OCC) Planning Department	Yes – meeting	Meetings: 06/02/09 28/07/09	The following comments are noted from the meeting with OCC: ▪ OCC expect that the development will be considered SID and therefore consultation should be undertaken with An Bord Pleanála ▪ Development in area designated as high amenity – photomontages to be prepared to support the LVIA ▪ The location of the development site in respect of Lough Boora should be considered ▪ Grey Partridge and other protected avian species are present in the area (Lough Boora) ▪ New County Development Plan should be considered ▪ OCC actively encourage regeneration of brownfield site in the County ▪ Consult with CMcC (OCC) on Roads aspect ▪ Consult with DH on (OCC) Sanitary Aspect ▪ What is potential impact to Silver River ▪ Is the development subject to COMAH – consult with HSA
An Bord Pleanála	Yes – meetings and letters	Meetings: 05/03/09 07/03/09 17/06/09	▪ Pre-Application Consultation undertaken ▪ Record of Meetings issued by An Bord Pleanála contained in Appendix 1.2. ▪ Consult with Shannon Regional Fisheries Board, Department of Environment Heritage and Local Government (incl. NPWS), EPA and the public ▪ Details of the former ESB power plant should be included in the LVIA for comparative purposes ▪ Development considered to be SID
Roads and Traffic			
Offaly County Council Roads Department	Yes – email	04/03/09	▪ Traffic Impact Assessment to be completed using up-to-date traffic volumes ▪ Road Safety Audit to be completed ▪ Further consult on Road Pavement Analysis on any roads (excluding National) that will be used for construction purposes ▪ Route of natural gas to the site should be shown
National Roads Authority	Yes – letter	27/02/09 23/03/09	▪ No specific observations

Water			
Offaly County Council Water Department	Yes - email	01/04/09	▪ Foul and surface water discharge to Silver River ▪ Potable water supply for the development to be determined – Potential for connection to local group water scheme supply routed beneath road at front of site
Environmental Protection Agency (EPA)	Yes – letter	09/03/09	▪ Development requires IPPC licence – environmental emissions will be considered as part of the licence application and BAT should be used in the design and carrying out of activities ▪ WYG also consulted with the EPA on 30/06/09 in respect of the former ash dump located south east of the proposed development lands. ▪ The former licence is surrendered and therefore the EPA have no concerns with it, but will consider the appropriate level of monitoring based on a new application
Office of Public Works (OPW)	Yes –Letter	27/02/09 22/04/09	▪ Notification has been forwarded to the regional engineer ▪ The OPW noted that the development is located in an area identified as benefiting land from the Brosna Drainage Scheme, Channel C3(1). As there may be a risk of flooding at this location, the development should ensure that there is an adequate level of protection against flooding and may require the finished levels being set above the 100-year design flood level plus freeboard. ▪ OPW also request a 10m wide trip be retained for ongoing access and maintenance of channels (including minor) and embankments. The strip should be accessible to mechanical plant and should not be landscaped, paved or otherwise development to prevent access

Shannon Regional Fisheries Board (SRFB)	No	-	▪ Followed up letter with further correspondences to PMcD and MF (SRFB). Received return phone calls from PMcD and MF in April and July 2009. Comments noted from correspondence are as follows:
			  ▪ The effect of abstraction of groundwater during summer months (low flow)
			  ▪ The effect of temperature of wastewater discharges on the Silver River
			  ▪ Adequate bunding should be provided for diesel storage on site

Archaeological and Architectural Heritage			
Department of Environment Heritage and Local Government (Development Applications Unit)	Yes – Letter	25/03/09	▪ Areas of high archaeological potential including subsurface archaeological structures should be assessed ▪ Architectural heritage also needs to be considered as part of the cultural heritage assessment. If no structures of heritage exist this should be documented
The Heritage Council,	No		

Flora and Fauna			
Department of Environment Heritage and Local Government (Development Applications Unit)	Yes – Letter	25/03/09	▪ No adverse impacts to Silver River and water quality from development ▪ Bird Species – existence in the surrounding area (Bord na Mona cutaway bogland) of bird species including hen harrier, whooper swans, grey partridge and wintering waders. ▪ WYG made follow-up call to Regional Manager NPWS and he confirmed that he received the notification letter and his comments are included in the letter received from the Development Applications Unit, dated 25/03/09
Fáilte Ireland	Yes – Letter	19/03/09	▪ Lough Boora Parklands – wildlife including grey partridge (turraun site)

Shannon Regional Fisheries Board (SRFB)	No	-	▪ Followed up letter with an email and telephone call to PMcD and MF (SRFB). Received return phone calls from PMcD and MF in April and July 2009. Comments noted from correspondence are as follows:
			  ▪ The effect of abstraction of groundwater during summer months (low flow)
			  ▪ The effect of temperature of wastewater discharges on the Silver River
			  ▪ Adequate bunding should be provided for diesel storage

National Parks and Wildlife Service – Regional Manager	No		▪ WYG called Regional Manager (PC) to confirm receipt of notification letter. Regional manger confirmed he had received the letter and his comments are incorporated in the response letter received from the Development Applications Unit, dated 25/03/09 ▪ In addition, telephoned NB (West Offaly NPWS Conservation Ranger) on 05/8/2009. NB said he didn't think Grey Partridge would breed at the site of the proposed power station but that we should check with KB of the Irish Grey Partridge Conservation Trust. NB commented on potential badger setts in nearby woodland. He also enquired if new power lines would be constructed. NB said that at this stage he didn't see any problems with the development on the proposed brownfield site.
Central Fisheries Board	No		
Irish Peatland Conservation Council	No		
Bat Conservation Ireland	No		
Irish Grey Partridge Conservation Trust	No		▪ Telephoned KB (Irish Grey Partridge Conservation Trust) on 05/07/09. KB said that he had not received the notification letter issued in February and therefore requested that he be provided with more information.
Birdwatch Ireland and Irish Wildlife Trust	No		

Coillte Teoranta	Yes – letter	06/05/09	▪ Provide more information on the potential impact of stack emissions (acidity)on forestry in the locality
Human Beings			
Fáilte Ireland	Yes – Letter	19/03/09	▪ Lough Boora Parklands (being developed with Green Tourism agenda) and Wildlife –Amenities ▪ Development is on main approach route to Clonmacnoise ▪ Any further consultation (specific queries) should be undertaken with Shannon Development, Birr Technology Park, Birr, Co Offaly
Health and Safety Authority (HSA)	Yes -letter and email	27/02/09 09/03/09 31/03/09	▪ Site considered lower tier COMAH/Seveso site due to diesel storage for back up fuel (ca 5,000m^3). Therefore full development requires risk and consequence assessment as per guidelines including gas ▪ HSA require a detailed consequence and risk assessment in order to formulate a response to a request for advice on a planning application. This assessment should model the consequences of credible events, their effects at nearest residences and estimate the risks of same. See the following link for further information relating to the HSA approach to Land Use Planning
Health Service Executive (HSE)	Yes	31/03/09	The EIS should address ▪ Generators ▪ Delivery and storage of diesel and other chemicals ▪ Water supply and its treatment ▪ Storage and disposal of storm water ▪ Storage and disposal of foul water ▪ Welfare facilities for employees during construction and operation
Irish Farmers Association	No		
Material Assets			
Fáilte Ireland	Yes – Letter	19/03/09	▪ Natural Resources - Lough Boora Parklands
Department of Communication Energy and Natural Resources	Yes – Letter	13/03/09	▪ Will comment at a later stage on the specific energy characteristics of the proposed project and how fits in with energy policy ▪ No observations relating to planning and environment -outside of remit ▪ Refer to CER in respect of permission to construct development
Commission for Energy Regulation	Yes		▪ Lumcloon Energy in Gate 3 application process
Sustainable Energy Ireland	Yes – letter	06/03/09	▪ No comment but note the governments strategic goal of reliable, secure and competitively priced electricity and this demands additional generating plants
Electricity Supply Board	Yes - letter	27/02/09	▪ No comment or view to express in relation to the planning application

Bord Gáis	No		▪ WYG to consult Bord Gáis on the proposed development
Irish Aviation Authority	Yes letter	04/03/09	▪ Aviation warning lighting will need to be considered if any structures are more than 80m above ground level
Soils and Geology			
Department of Agriculture Food and Rural Development	No		
Teagasc	No		
Environmental Protection Agency (EPA)	Yes – letter	09/03/09	▪ Development requires IPPC licence – environmental emissions will be considered as part of the licence application and BAT should be used in the design and carrying out of activities ▪ WYG also consulted with the EPA on 30/06/09 in respect of the former ash dump located south east of the proposed development lands. ▪ The former licence is surrendered and therefore the EPA have no concerns with it, but will consider the appropriate level of monitoring based on a new application
Geological Survey of Ireland	Yes - letter	09/03/09	Irish Geological Heritage Section ▪ IGH is currently in partnership with NPWS to identify sites for NHA designation – in process of finalising the proposed sites. There are no geological heritage sites on the proposed development, however Lough Boora is located ca 2.8km SE of the site. It is listed under IGH7 and IGH14 themes ▪ Would like to be provided with SI reports for the site so that data could be added to national database of SI boreholes ▪ Also require notification of ground excavations – that may provide geological exposures for examination – record purpose ▪ Should any be bedrock be exposed – should be designed to be left exposed
Air			
Environmental Protection Agency (EPA)	Yes – letter	09/03/09	▪ Development requires IPPC licence – environmental emissions will be considered as part of the licence application and BAT should be used in the design and carrying out of activities ▪ WYG also consulted with the EPA on 30/06/09 in respect of the former ash dump located south east of the proposed development lands. ▪ The former licence is surrendered and therefore the EPA have no concerns with it, but will consider the appropriate level of monitoring based on a new application
Coillte Teoranta	Yes – letter	06/05/09	▪ Provide more information on the potential impact of stack emissions (acidity)on forestry in the locality

Noise			
Environmental Protection Agency (EPA)	Yes – letter	09/03/09	▪ Development requires IPPC licence – environmental emissions will be considered as part of the licence application and BAT should be used in the design and carrying out of activities
Landscape and Visual			
Fáilte Ireland	Yes – Letter	19/03/09	▪ Lough Boora Parklands (being developed with Green Tourism agenda) and Wildlife –Amenities ▪ Development is on main approach route to Clonmacnoise ▪ LVIA specialist also consulted with OCC in respect of potential visual impact
Other Bodies			
An Taisce	Yes - Letter	29/05/09	Spoke with An Taisce on 22/05/09. EM stated that An Taisce were totally opposed to gas power generation plants and are of the view that they are neither environmentally or economically sustainable. A formal letter of response was provided by An Taisce on 29/05/09. Comments outlined in letter relate to the following ▪ Background to the site ▪ Technical clarifications on plant type being proposed ▪ Operation times of plant ▪ Air pollutants generated ▪ Details of connection to the electricity grid ▪ Details of connection to the gas network ▪ EIS should be comprehensive ▪ An Appendix was also attached to response letter which outlines An Taisce's comments in relation to the potential impacts and mitigation measures associated with a development in Co Donegal
An Garda Siochána	No		
Border Regional Authority	No		

1.9 DIFFICULTIES IN COMPILING SPECIFIED INFORMATION

No significant difficulties were encountered during the compiling of the EIS.

2.0 DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 CHARACTERISTICS OF THE PROJECT

Following the assessment of alternative plant options, it was concluded that the most suitable and appropriate plant was a mid merit plant which would be capable of producing a thermal output of approximately 350MW, would be flexible in design and operation to meet fall-off in output from wind generation plants (peaking capability) and would be capable of meeting load demand requirements as indicated in the Eirgrid forecast document 2009 to 2025.

The contract to supply and construct the plant will be by open international competition. The final and precise plant output and scheme layout therefore cannot be specified at this stage without bias to a particular manufacturer or supplier. The result of a tendering process will be the award of a contract for a particular model of gas turbine. Lumcloon Energy has already received substantial interest from a number of international suppliers and is in talks with regard to determining the most suitable plant for the site. The performance of the final plant will be required to comply with the environmental objectives and design proposals as presented in this EIS in order to ensure a minimal negative impact on the receiving environment. The worst case scenarios have been considered in the EIS to ensure that the potential impacts from such a development have been assessed for all potential scenarios.

The power plant will supply electricity via the regulated electricity market. Natural gas, supplied from the Bord Gáis Network (BGN) grid, will be the primary fuel source for the facility. To comply with Commission for Energy Regulation (CER) regulations, diesel will be used as a backup fuel in the event of interruption to the natural gas supply. Five days running capacity of diesel will be stored on site, (approximately 5,200m^3) within a 110% capacity bund. The diesel oil will be limited to 0.1% sulphur in fuel as per the requirements of the Sulphur Content of Heavy Fuel Oil, Gas Oil and Marine Fuels Regulations, 2008 (S.I. 119 of 2008) *EU Directive 1999/32/EC, (relating to a reduction in the sulphur content of certain liquid fuels).*

2.1.1 Description of the Existing Site

The proposed development site is approximately 11 acres and located adjacent to the R357. The site is about 5km south east of Ferbane, circa 22km south of Athlone and 20km west of Tullamore. The proposed development lands are brownfield and the site is part of the former ESB owned peat fired power station site, which was decommissioned in 2004. The site is situated in the Shannon River basin district and the Silver River is located approximately 50m to the East of the site and flows north into the Clodiagh, which joins the Brosna River, which in turn flows into the River Shannon. There is a relatively small wooded area in the north western area of the site. There are large parcels of cutaway bogland and forestry to the south west and north-west of the site and industrial railway associated with the former peat power station run out from the former peat power station to the surrounding boglands. The surrounding topography is generally flat with nearby once-off rural housing primarily located south west of the site along a local road, which borders the site to the west and runs in a south western direction from the R357 to the R437. The existing site layout is shown on Figure 1.2 attached and on Planning Drawing Reference Number C007331-02. Figure 2.1, below, shows an aerial view of the proposed development site in 2005.

Figure 2.1 Aerial View of Proposed Site 2005

Source OSI


View south west from north east area of site


View towards west from north east area of site


View towards site entrance from south west


View towards east from south west area of site


Ground conditions adjacent to northern boundary


Ground conditions in centre of the site


Existing site entrance – facing north


View towards south east from northern boundary

2.1.1.1 Former Ferbane ESB Power Station

The existing site formed part of the former ESB peat fired power station. Construction of the former ESB owned peat power station at Lumcloon commenced in May, 1953 and the first development of 60,000 kilowatts was commissioned in 1957. A further 30,000 kilowatts was commissioned in January 1964. This brought the total capacity of the station to 90,000 kilowatts (90MW). The station burned approximately 2,000 tonnes of peat per day delivered to the site by rail from the surrounding boglands. The plant comprised four units which produced 2 million units of electricity per day when on full load. Each unit consisted of a boiler, a turbine, a generator and a transformer. The electricity was generated at 10,000 volts and transformed to 110,000 volts for transmission into the national grid. Two reinforced concrete hyperbolic cooling towers stood at the site through which 18,184m^3 of water per hour was continuously circulated and cooled. Each tower had an internal diameter of approximately 60 metres and rose to almost 90 metres in height above ground level. Figures 2.2 to 2.5 show the physical size of the former generation station at Lumcloon.

Figure 2.2 View from Entrance to the Former Ferbane Peat Fired Station

Figure 2.3 Aerial view of Former Ferbane Peat Fired Power Station

Figure 2.4 View from the South East of Former Ferbane Peat Fired Station

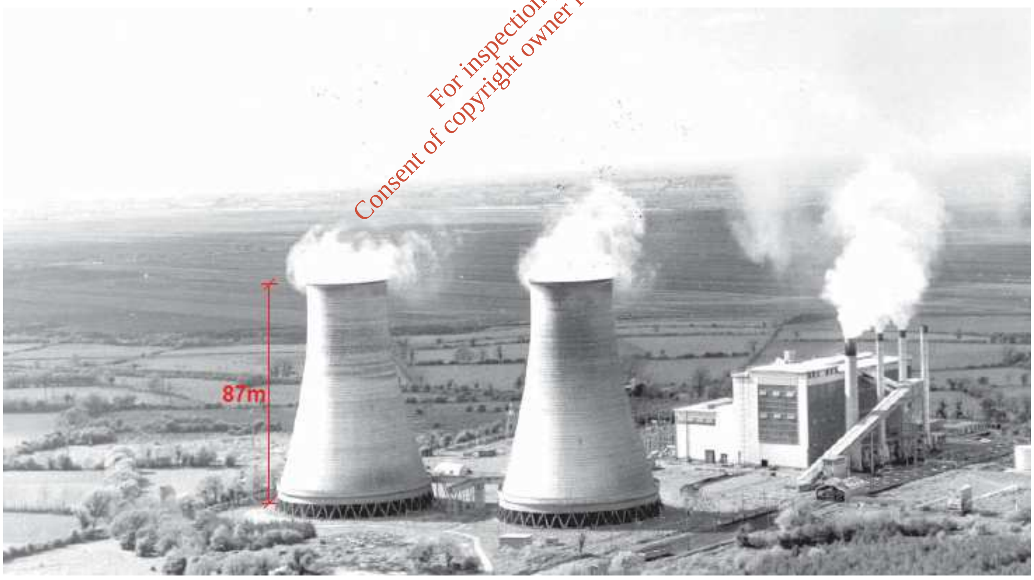
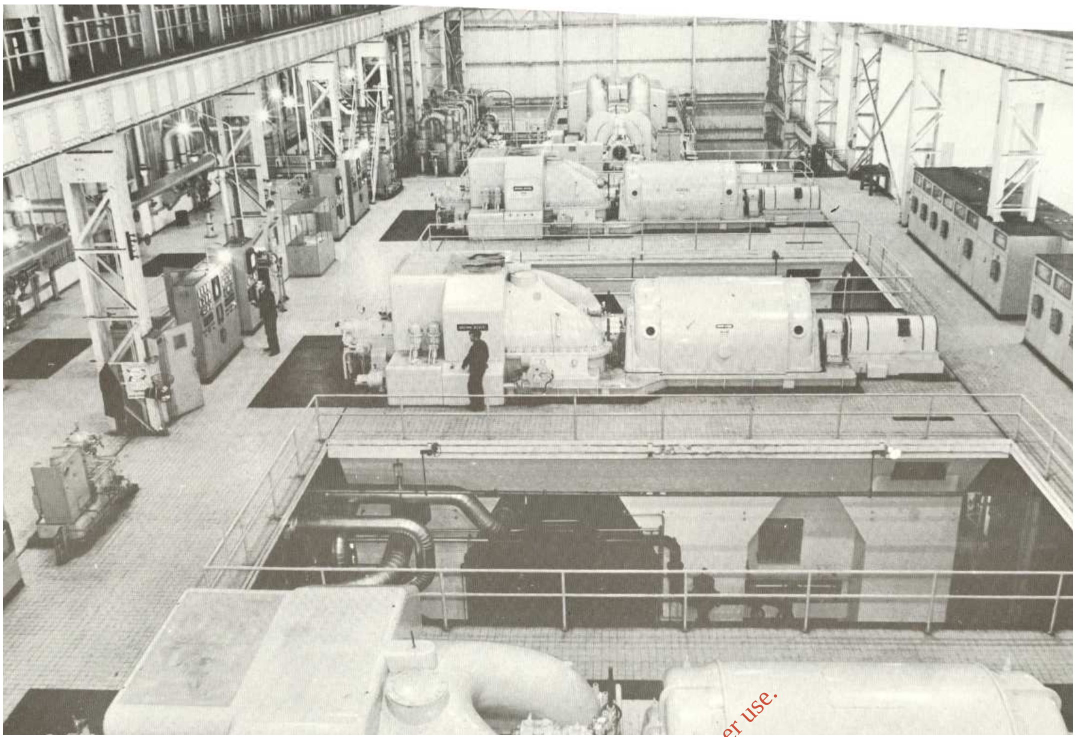


Figure 2.5 Internal View of Former Ferbane Peat Fired Station



The station was officially closed in 2001 and decommissioning works were completed in the following years. Figure 2.6 shows the first cooling tower being demolished in 1999.

Figure 2.6 Demolition of the First Cooling Tower at the Former Ferbane Peat Fired Station

Source: www.ferbane.tv

2.1.2 Description of Proposed Site Layout

The site is predominantly flat generally ranging in height (between 45m ordnance datum (OD) and 47m OD Malin Head datum). The site layout of the proposed facility is shown on Figure 2.7 attached, Planning Drawing Reference Number C007331-05.

It is proposed to access the site from the R357 through the existing entrance/exit to the site. This will be used as the main entrance to the proposed development and is located beside the proposed administration building in the north-west area of the site. It is proposed to construct a second entrance for emergency use further east along the R357 towards Lumcloon Bridge.

It is proposed to construct a two storey administration building which will be 10.6m to roof apex from ground level. Approximately 30 car parking spaces will be provided for employees and visitors in this area of the site during the operation of the plant. A 400 m^2 warehouse containing a workshop and stores will be located south of the administration block, adjacent to the switchyard.

The power generation building comprising gas turbine halls, steam turbine halls and heat recovery steam generator halls) will be constructed as one structure with different roof heights determined by the plant components within. The total footprint of the power generation building will be 6,684m^2. Two air cooled condenser (ACC) units, each with nine fans will be located on the eastern side of the power block. The parapet of both ACC units will be 24.5m above ground level. A description of all plant components is provided in Section 2.1.4.

The tallest structures on the site will be the four exhaust stacks from the HRSG units. Following air dispersion modelling it was determined that these should be 49m in height to facilitate emissions dispersion. This is significantly less than the height of the two reinforced concrete hyperbolic cooling towers which were the tallest structures (almost 90m) on site during the operation of the former peat fired station. Further details on the heights of structures at the site are presented in Section 6 Landscape.

Internal roadways will be tarmac paved and the ground around external plant components such as the AGI, gas receiving, switchyard and the ACCs will be covered with stone chippings to facilitate natural drainage.

Table 2.1 below provides details of footprints of the main structures on the site and their heights, if applicable.

Table 2.1 Size Details of Facility Components

Component	Footprint on the site (m^2)[Note 1]	Height (m)
Gas Turbine Hall (2 no) – open cycle	2,642	14.0
Heat Recovery Steam Generator Hall (2 no)	2,632	28.0
Steam Turbine Hall (2 no.)	1,410	14.0
Air Cooled Condenser (2 no.)	3,104	24.5
Ancillary area of power generation building (1 no.) -ctrl room, lab, etc	1,745	12.0
Open Cycle Stacks (4 No.)	NA	38.0
Heat Recovery Steam Generators (HRSG) stacks (4 No.)	NA	49.0
Administration Building (1 no.)	400	10.6
Warehouse/Workshop/Stores (1 no.)	840	12.9
Switchyard (1 no.)	8,583	NA
Above ground Installation (1 no.)	1,300	NA
Internal Roads and Carparking	6,675	
Bund for Diesel Storage (1 no.)	2,861	2.4
Diesel Tank (2 no.)	1,102	6.0
Fuel Oil supply pumps canopy (1 no.)	167	7.0
Raw Water Tank (1 no.)	314	11.0
Water Treatment Plant (1 no.)	800	10.0
Demineralised Water Tanks (2 no.)	113	4.3
Process Wastewater Treatment compound (1 no.) - underground	530	NA
Storm water Attenuation tank (1 no.) - underground	1,000	NA

Note
1 Where there are more than two component items, footprint detailed is for combined number specified.

The structural design of the main buildings will be conventional structural steel supported on reinforced concrete foundations. Steel columns will be fire protected as necessary to comply with the building regulations. Floors will be concrete. The administration building and some of the smaller buildings will be concrete block construction on concrete reinforced concrete foundations and rendered with nap plaster finish. Profiled metal cladding will be used for external walls on power generation buildings. The finished colour of the plant structures will be designed to favour the reduction of potential visual impacts. Non reflective finishes will be used in order to reduce or avoid impacts relating to sunlight reflection or glare. Colours of buildings will be confirmed with the planning authority prior to construction.

Roofs will be constructed of profiled metal decking on purlins spanning between rafters and will be flat or shallow pitched. Buildings will be single or two storeys with access gantries and walkways for access to plant and equipment. These will be constructed of stainless / galvanised steel open grating type flooring supported on steel beams and columns. The stack will be fabricated from painted insulated carbon steel. External doors and escape doors will generally comprise of metal flush doors and mild steel frames.

2.1.3 Description of Proposed Plant Design

The proposed plant will have capability of producing up to a maximum of 350MW of power. The plant itself (house load) will consume approximately 15MW of the total output. The power generation plant will essentially be constructed as one power block and will be capable of running in either open cycle or combined cycle modes. The proposed power block will comprises four small scale (<50MW) gas turbines, four heat recovery steam generators (HRSGs) and two steam turbine generators producing a further 75MW. Diverter dampers are installed between the gas turbines and the heat recovery boilers and will enhanced the generating flexibility of the plant. For example, the four gas turbines in open cycle mode will be capable of producing electricity in the range of 47MW to 188MW, in the event of shutdown of the steam turbines or to respond to demand by the TSO. In the event of shutdown of one of the steam turbines, the plant would still be capable of producing approximately 224MW of power (i.e. operation of two gas turbines in open cycle mode and two gas turbines in combined cycle). The plant will be capable of starting up and reaching full load in open cycle (188MW) mode in 25 minutes. In combined cycle mode, typical start-up times are as follows:

- From cold start (i.e. plant shutdown for more than 64 hours), the plant will take approximately 300 minutes to reach full load
- From warm start (i.e. plant shutdown for less than 64 hours), the plant will take approximately 220 minutes to reach full load
- From hot start (i.e. plant shutdown for less than 8 hours), the plant will take approximately 90 minutes to reach full load

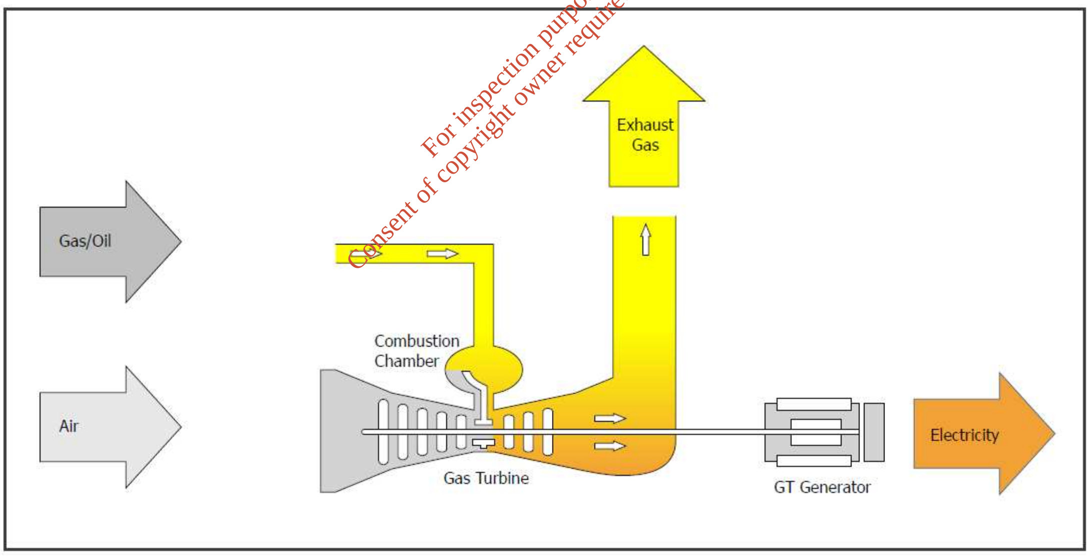
Each HRSG will also be fitted with supplementary gas burners thereby producing around 32.5MWs of power at the alternator terminals. The supplementary firing ramp-up rate is around 3MW per minute; which means that the load can increase from combined cycle operation to maximum load within 10-minutes.

The power plant will be designed and configured to allow for high efficiency base load, while also providing for peak power capacity through out a wide load range. The design concept with a total of four gas turbines and two steam turbines allows for operation at a high efficiency and low emissions values throughout a wide plant power output by the possibility to reduce the power on the GTs one by one.

2.1.3.1 Open Cycle Process

In open cycle mode, conditioned gas is burned in a gas turbine which is linked to a generator which produces electricity. The residual heat is exhausted to atmosphere at a temperature of approximately 544°C, i.e. unlike in combined cycle mode where exhausted heat is recycled to generate steam and ultimately additional electricity. Open cycle gas turbines (OCGTs) are less efficient than combined cycle gas turbines (CCGTs) with typical efficiencies of approximately 37.5%. However the advantage operation in open cycle mode is that the plant can supply electricity in a much shorter timeframe than in combined cycle. In open cycle mode, the plant will be capable of producing 188MW of power. Figure 2.8 below illustrates the open cycle process.

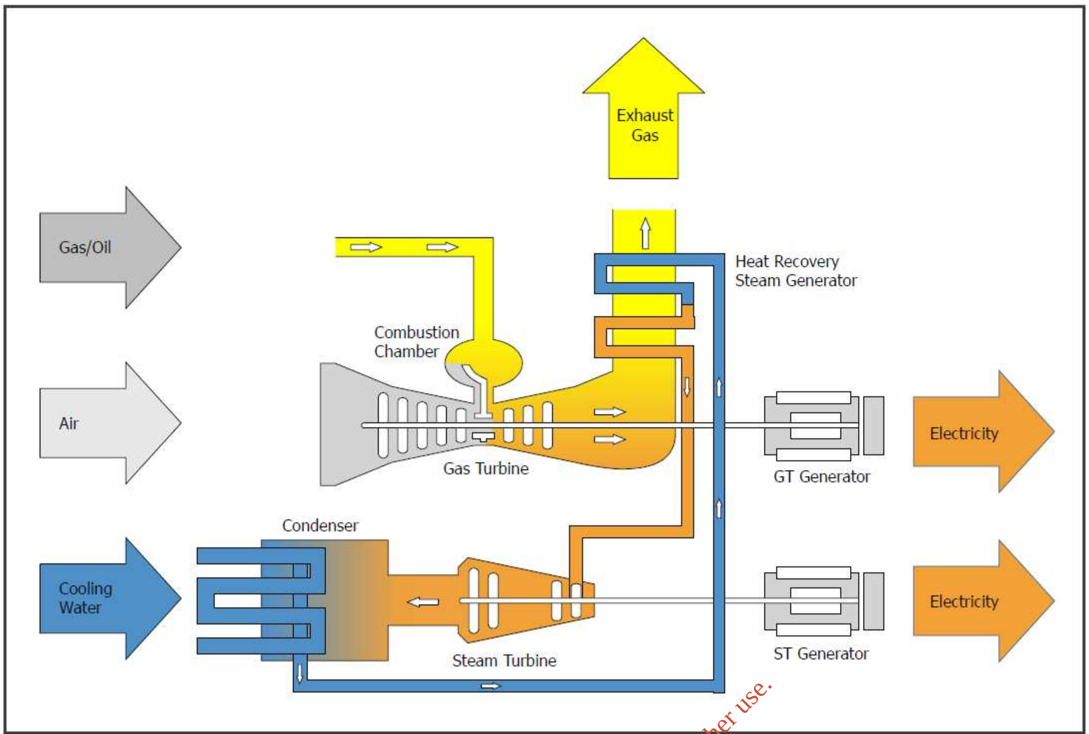
Figure 2.8 Open Cycle Process



2.1.3.2 Combined Cycle Process

In combined cycle mode, a conditioned gas is combusted in the gas turbine generator producing electricity and the waste heat from the gas turbine is used to make steam to generate additional electricity via a Heat Recovery Steam Generator (HRSG) and a steam turbine. Figure 2.9 below, illustrates the combined cycle process.

Figure 2.9 Combined Cycle Process



2.1.4 Description of Proposed Plant Components

2.1.4.1 Gas Turbine Generator

Air enters the gas turbine where it is compressed, mixed with natural gas and ignited, which causes it to expand. The pressure created from the expansion spins the turbine blades, which are attached to a shaft and a generator, creating electricity. In simplistic terms a generator can be described as a large spinning magnet inside a coil of wire and as the magnet spins, electricity is created in the wire loops. The hot exhaust gas exits the turbine and then passes through the Heat Recovery Steam Generator (HRSG).

2.1.4.2 Heat Recovery Steam Generator (HRSG) with Exhaust Stack

Within a HRSG, there are layers of tall tube bundles, filled with high purity water. The hot exhaust gas coming from the turbines passes through these tube bundles, which act like a radiator, boiling the water inside the tubes, and turning that water into steam. The gas then exits the power plant through exhaust stack(s) at a much cooler temperatures, after having given up most of its heat to the steam process. Stack height assessment was undertaken as part of air dispersion modelling with cognisance of local requirements. This is discussed in Chapter 11, Air Quality.

2.1.4.3 Steam Turbine Generator

The steam generated is sent to the steam turbine. Stem enters the turbine at very high temperatures and under high pressure. The pressure of the steam is used to spin turbine blades that are attached to a rotor and a generator, producing additional electricity. After the steam is spent in the turbine process, the residual steam leaves the turbine at low pressure and low heat, and passes into a condenser, to be turned back into water. By using a combined cycle, the plant is capable of producing more electricity. A CCGT generator can reach efficiency levels of up to 58%. The efficiency of the proposed CCGT unit means that this type of generator emits the lowest levels of greenhouse gases per unit of electricity generated when compared to any conventional generation type.

A flexible CCGT unit, such as that being proposed at Lumcloon, is also capable of varying the power generation across a wide range of power output and can turn on and off on a daily basis, which allows this unit to maximize the electricity generating potential from variable renewable energy sources such as wind.

2.1.4.4 Air Cooled Condenser

An air-cooled condenser (ACC) is used to condense the steam exhausted by the steam turbine. This solution provides a completely plume free arrangement. The hot process fluid to be cooled flows through a tube while the cooling air flows across the outer surface to remove heat. The cooling air is propelled by fans in either a forced draft or induced draft configuration. Specially designed fins are attached to the outer surface of the tube to create a large surface area for more effective cooling. The heat transfer rate is a function of the fins' surface area and the velocity of the air flow. The mechanical design of the exchanger must accommodate the process conditions including pressure and temperature and, possibly, corrosivity, fouling and condensation. While the ACC is larger in appearance than alternative cooling options, it significantly reduces the demand for water (closed loop) and does not give rise to a visible water vapour plume.

Condensate from the ACC is pumped through a series of feed-heaters to a de-aerator vessel, from where it is pressurised using high-pressure pumps, and returned to the HRSG where the overall cycle restarts.

2.1.4.5 Other Plant Components

Typical other plant components include the following:

- Above Ground Gas Installation (AGI) and associated piping

- Gas receiving plant
- Switchyard and substation
- Transformers
- Administration /control building
- Raw and fire water storage tank
- Demineralisation water treatment plant and storage
- Process wastewater treatment system
- Surface water collection system
- Foul wastewater treatment system
- Distillate storage
- Chemical storage
- Building to house power plant
- Warehouse /stores building
- Internal roads and parking

Above Ground Installation

Natural gas will be supplied from Bord Gáis Network's (BGN) at a minimum guaranteed pressure of 19 bar gauge (bar(g)) and 15^{o}C. The design maximum pressure of the BGN gas pipeline is 70 bar(g). The pressure of the gas will be regulated to approximately 35 bar(g) in the AGI. From this compound, gas will be sent to gas receiving plant for conditioning.

Gas Receiving

The gas will pass through gas conditioning plant located close to the gas turbine hall. This compound will be secured by fencing and will comprise:

- Liquid and dust separator
- Dew point heater / boiler unit
- Gas compressor
- Filter separator

Transformers

Transformers will be located outdoors and will be the oil immersed design type. Transformers will be bunded and blast protected. It is proposed to install six step-up transformers, one for each turbine generator, as part of the proposed development.

Switchyard

The electricity generated from the power plant will be fed to generator transformers where the voltage will be stepped up to 220 kV. From each transformer, the power passes to the switchyard. The power from all of the generators comes together, where it is measured, metered and directed onto the national grid in accordance with the requirement of Eirgrid. The proximity of the site to the existing transmission masts (in the south western corner of the site) enhances the proposed site location for the purposes of power plant development.

Administration /Control Room

From the control room, the plant operators monitor and operate the facility, via the plant's 'Distributed Control System', with the click of a mouse, viewing graphic representations of all MEC systems on various screens. The system gives operators both audible and visual signals to keep them informed of plant conditions at all times and to determine when preventative maintenance is required.

Raw Water

Water for use in the process will be pumped for the existing on site well which served the former peat burning power plant. Raw water will be stored on site in a tank of approximately 3,500m^3 capacity. Water will be pumped from the raw water storage tank to the water demineralisation treatment plant for use in the power generation process. The raw water storage tank will also serve as a reservoir for fire fighting purposes.

Demineralised Water Treatment and Storage

An on site water treatment plant will be required to treat abstracted groundwater for use in the HRSG. Water will be demineralised to achieve a high purity. The primary reason for process water treatment is to maintain the integrity and performance of the power plant. Critical plant applications have water purity or conditioning requirements that must be adhered to for safe, reliable and efficient power generation. Experience has shown that integration of water technology treatments with power plant design can be very important in reducing operational problems and component failures.

The characteristics of potential surface and groundwater supplies vary widely depending on their geographical location and source. Impurities such as dissolved and suspended solids, , colloidal species and dissolved organic matter, determine the suitability of the water for use in the various processes of a power plant and the necessary treatment requirements to make it acceptable for use.

The water treatment process will consist of filtration, and either a resin based or a Reverse Osmosis and Electro De-ionisation (EDI) based treatment system. pH adjustment will be provided by acid (sulphuric) or alkali (sodium hydroxide) addition as required. Additional equipment may be applied to the system if the water quality warrants it. This equipment may include an optional decarbonator and a softener, if required.

Oxygen scavenging and thermal de-aeration will be combined to remove dissolved oxygen from the boiler water which again prohibits corrosion.

It is expected that demineralisation water consumption (losses and blow-down) will be in the range of 0.5 to 1.0% of the maximum steam flow from HRSGs to compensate for boiler blow down for a condensing plant without process extractions. A 0.5% flow would equate to a need for approximately 1m^3 of water per hour per HRSG, which equates to approximately 96m^3 per day. Deviations may appear during unusual conditions and as a result requirement may at times be in the range of 3% of the HRSG steaming rate. The figure will also be influenced by raw water quality and the selected method of water treatment.

The capacity of the demineralised water storage tank will be sized following consideration of the volume required for filling up of the steam/water system. At this stage it is estimate that the volume required to fill system from empty will be approximately 420m^3. Therefore it is proposed to install two 300m^3 water tanks to supply the HRSG system.

Distillate (diesel) Storage Tank – back up fuel

Diesel will be stored in a cylindrical steel tank within a 110% capacity bund to comply with bunding requirements. The bund will be constructed in accordance with CIRIA Report 163 "Construction of bunds for oil storage tanks" and BS8007:1987, Code of practice for design of concrete structures for retaining aqueous liquids). The diesel will be delivered via road tanker. Due to the quantity of stored diesel, estimated an approximately 5,200m^3 within two tanks of a combined storage capacity of 6,000m^3, the site will be classified as lower tier COMAH in accordance with the requirements of European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2006 (S.I. No. 74 of 2006). In accordance with legislative requirements, a major accident hazard (MAH) report was prepared for the proposed development. This report details risk and consequence assessments for the site in accordance with the Health and Safety Authority (HSA) guidance document entitled 'Setting the Specified Area – The Approach of the HSA' related to the application of the European communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulation 2006 (S.I. No. 74 of 2006).

2.1.4.6 Process Wastewater Treatment

Process wastewater consists of wastewater from the demineralisation plant and wastewater generated from boiler blow-down. Wastewater from the demineralisation plant comprises water containing the salts removed from the raw water or neutralised backwash of the resins from the demineralisation process. Boiler blow-down comprises water which has been circulating in the water/steam cycle. If allowed to accumulate, these contaminants can reduce boiler performance. Process wastewater will be continuously generated from the plant while in combined cycle operation mode. There is little wastewater generated while in open cycle mode. Typical normal wastewater volumes generated is approximately 96m^3 per day. A water and wastewater flow diagram is illustrated in Figure 2.10 below.

Steam generated in the HRSGs is used to drive the steam turbine generators. The steam is then condensed back to water via the air cooled condensers for reuse in the process. Therefore no cooling waters will be discharged. Process effluents from the plant will be routed via the on-site process wastewater treatment plant to effluent drainage system. The Process wastewater treatment plant will comprises a below ground concrete structure containing a number of chambers which will allow agitating, pH and temperature correction. Continuous monitoring will be undertaken in the final chamber for dissolved oxygen, pH, conductivity and temperature. Treated process wastewater will then be discharged to the wastewater collection system to the Silver River via the discharge point located in the north eastern corner of the site. An automatic sampler will also be positioned at the discharge point, which will sample water discharges on a continuous basis over a given period as prescribed by the Integrated Pollution Prevention and Control (IPPC) licence. An on site laboratory will also be provided to facilitate monitoring of specific parameters on site.

The following describes the plant's process effluent streams and treatments:

Gas turbine compressor cleaning solution

In order to avoid/reduce the gas turbines performance degradation, offline compressor washing will be performed at certain intervals. The used gas turbine cleaning solution will be temporarily stored in a drain tank and then delivered to the treatment plant via a water/ oil separator. Normal volumes of compressor wash is estimated at 0.6m^3 per event per gas turbine compressor. Compared to wastewater produced from off-line compressor blowdown, the volume produced is relatively minor.

Water treatment effluent (demineralisation wastewater)

The ion exchange equipment produces both acidic and alkaline effluent streams during the equipment's periodic regeneration cycle. These streams are adjusted to neutral pH and then delivered to the process wastewater treatment plant. The reverse osmosis equipment will continuously produce a concentrated reject water stream that contains dissolved solids removed from the product water stream. Again this wastewater will be discharged to the process wastewater treatment plant prior to being discharged from site. The volume produced is dependent on the quality of raw water, but again volume is low relative to blowdown process wastewater.

Blow-down

During blow-down operation, water is blown down into the blow-down tank. Normal blowdown volume is estimated at $1m^3$ per hour per gas turbine. This is a water/steam flashing mixture when it enters the blow-down tank. Here, the effluent is cooled prior to being discharged to the wastewater treatment plant where it is treated prior to being discharged to the Silver River via the drain at the along the northern boundary of the site.

Gas Turbine and Closed Cooling Water System Anti-Icing Effluent

The gas turbine anti-icing/heating system and the closed cooling water system are filled with the freeze protection agent - a synthetic and homogenized glycol free solution based on salts. Unlike other freeze protection agents (like glycols) the solution is non-toxic and biodegradable and can thus be discharged to the process wastewater treatment plant.

Effluents Resulting from Plant Commissioning

During plant commissioning effluent will be produced related to plant cleaning procedures (e.g. condensate resulting from pre-operational steam blowing of steam piping). If not classified as hazardous liquid waste, these effluents will be diverted to the process wastewater treatment plant.

Chemical Feed Area Drainage (e.g. water treatment plant, cooling tower dosing, etc.)

Chemical feed area drainage consists of spillage, tank overflows, maintenance operations and area wash-downs. This wastewater will be contained and collected in a bund area and the drainage manually emptied by means of a mobile drainage pump.

Small areas that have the potential for causing oil contamination of surface drain water will be separated from the overall surface water drainage. This comparably low volume of surface water with potential for oil contamination will be collected separately and routed through a water/oil separator prior to being discharged to the process wastewater treatment plant.

General power plant drainage

General plant drainage consists of effluents produced by sample drains, equipment drains, equipment leakage, area wash-downs, etc. This effluent will be collected in a system of floor drains and sumps and routed to the condensate pit which represents the lowest drainage point in the plant. From there it is delivered to the process wastewater treatment plant via a water/oil separator.

Fire Fighting Water

In case of fire the applied fire fighting water will be drained into those parts of the plants effluent system which drain the affected areas and the resulting streams will finally be delivered to the client's storm water drain or effluent drain.

Surface Water Treatment

Surface water collected from roofed and paved areas will be delivered to the site storm water drainage system. In order to assure that uncontaminated surface drains are not mixing with possibly oil contaminated surface drains such 'oil risk areas' will discharge into a separate collection system. Surface water will be routed via an oil/water interceptor and finally surface water will discharge through an attenuation tank (controlled discharge) to the Silver River via the stream in the north eastern corner of the site. Large external areas/compunds at the site will be surfaced with stone to allow rainwater to percolate to the underlying soils.

During times when chemicals are handled, isolation valves will be closed. This is to assure that accidently spilled chemicals do not enter the storm water drain. The isolation valves will only be opened again once it has been assured that contamination of the downstream system can be excluded.

Foul Wastewater

Foul wastewater, which comprises wastewater other than process waste water and surface water, will be treated in a proprietary treatment system prior to discharge. Treated wastewater (from canteen and toilets) will be discharged to the Silver River via the stream which runs along the northern boundary. However the option of percolating to ground will also be considered at detailed design stage following completion of a site suitability assessment, including percolation testing, which will be undertaken to determine the suitability of the site. Offaly County Council and the EPA will be consulted through the assessment process. Figure 2.10 below shows water supply, treatment and usage at the proposed facility.

Chemical storage

The following is a typical estimate and list of chemicals which will be stored on site. Chemicals will be stored in designated areas and provided with bunding where appropriate.

Water treatment chemicals

- 10-tonnes of 47% sodium hydroxide
- 10-tonnes of 95/97% sulphuric acid
- 10-tonnes of caustic brine (25% sodium chloride NaCl, 5% NaOH)

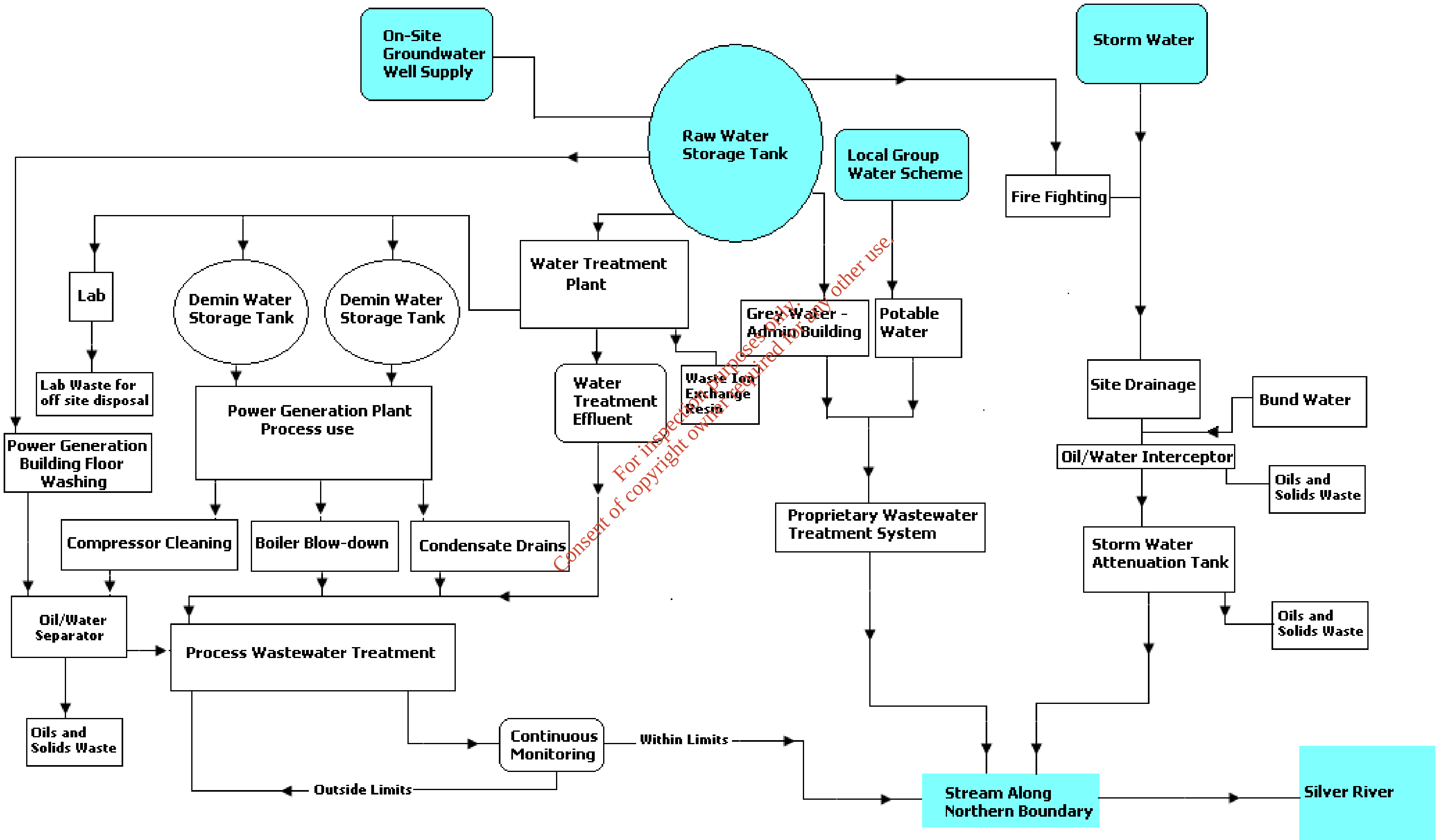
For boiler dosing

- 1.5 tonnes Ammonia
- 1.5 tonnes hydrazine
- 1.5tonnes caustic sodium hydroxide
- Also small quantities of hydrochloric acid and some other reference chemicals are required for calibrating of laboratory instruments.

Lubricants

- 1000 litres of turbine oil
- 500 litres of transformer oil
- 500 litres of assorted lubricating oils
- 100 kg of assorted greases

Figure 2.10 Water and Wastewater Flow Diagram



2.2 THE EXISTENCE OF THE PROJECT

2.2.1 Description of Construction

Description of construction is dealt with under Section 3 of the EIS.

2.2.2 Operation of the Project

The operators will recruit and train suitably qualified and technically competent staff who will be responsible for operation and maintenance of the plant. It is anticipated that the power plant will be staffed by approximately 45 employees in total. Employees will work on shift basis (three 8 hour shifts) and will cover a broad range of services including; safety, engineering, technical, security, chemical, maintenance and administrative support staff. Subcontracted maintenance staff will also be required at critical times such as an annual shutdown periods.

The plant will be operated under existing health, safety and environmental procedures, which include essential features such as staff training and awareness and an Emergency Incident Response Plan. The operator will develop an Environmental Management System which will be accredited to an international standard, e.g. ISO 14001.

Regulatory control of the facility is described previously in Section 1.2.

2.2.3 Description of Decommissioning (End of Plant Life)

The proposed Lumcloon gas fired power plant at Lumcloon has a projected life span of approximately 30 years, subject to recommended manufacturer maintenance programmes. At the end of the 30 year life cycle, there are primarily two options available for the proposed development. Theses are;

- Retrofitting the site for future power generation – upgrading plant components; and
- Decommissioning of the proposed facility in accordance with the requirements of the Environmental Liability Directive (2004/35/EC), to allow future development of the site. Decommissioning would require removal of chemicals, plant and machinery, buildings and structures, etc. from the site. The extent of decommissioning works will be determined by future use.

Environmental aspects related to decommissioning will be required as part of the application and enforcement of the IPPC Licence. The environmental liabilities risk assessment (ELRA) process will require the licensee to prepare and maintain a plan which will assess and manage environmental liabilities. This plan will be prepared in accordance with the 2006 EPA *'Guidance Document on Environmental Liabilities and Risk Assessment (ELRA), Residual Management Planning and Aftercare'*. This system of assessment and planning leads to:

- A reduction in the potential for environmental damage as the result of accidents
- Minimisation of residual / long term impacts from industrial facilities upon closure
- Forward financial planning for environmental liabilities
- Reduction in the financial provision required

Decommissioning of all aspects of the facility will be validated by the EPA prior to IPPC licence surrender.

2.2.4 Description of Other Developments

The construction of the proposed development will require construction of a gas pipeline from the existing gas network to the site at Lumcloon. This project is not part of this application and will be undertaken by Bord Gáis Networks (BGN). It is believed that the pipeline route from the gas network at Ories, near Athlone to the site in Lumcloon will be less than 20km. An Bord Gáis Networks would then apply to the CER for a licence to construct the proposed pipeline. This also requires preparation of a report to assess potential impacts to environmental aspects associated with its development.

The proposed development will require a connection to the National Grid, which is operated by Eirgrid, to allow for the supply of generated electricity to the market. However the development will not require construction of new overhead transmission lines due to the presence of four transmission lines on site, associated with the existence of the former peat fired plant at the site in Lumcloon.

3.0 CONSTRUCTION

3.1 INTRODUCTION

This section details the construction works associated with the proposed facility and indicates the mitigation measures to be implemented to ensure that potential environmental impacts associated with construction are minimised.

The development of this site is likely to occur over an estimated 32 month period commencing in early 2010, during which time construction activities will have the potential to impact the existing environment. After the estimated 32 month construction period, it is expected that a fully operational power plant will be commissioned and capable of operating in all design modes. The specific details of the construction programme are not currently known as such this programme will be developed by the main contractor. It is therefore difficult to assess the staffing and delivery levels for the development. However it is considered that the design and proposed layout of the facility has developed sufficiently to discuss the potential environmental impacts of proposed construction methods. An estimate of construction traffic volumes has been made for a site of this size and typical works associated with a development of this type are described.

The timing of the commencement of construction is subject to planning, design, tendering and ecological constraints. It would be expected, that any works associated with site clearance and removal of woodland would be seasonally limited to mitigate against any adverse ecological affects. The impact of construction activities on Flora and Fauna and Roads and Traffic are assessed in Chapters 10 and 14, respectively. A construction management plan will be developed and implemented for the construction phase of the development. This document will provide a framework under which construction activities which have potential for environmental impact (e.g. generation of dust, ecological impacts, surface water discharge, etc) will be managed. Mitigation measures as outlined in the EIS will be included within this plan.

Table 3.1 Typical Construction Timeframe

Phase	Activity	Anticipated Duration
1	Site Evaluation	Up to 2 months
2	Site Preparation and Clearance	Up to 2 months
3	Civil and Structural Works	16 months
4	Mechanical and Electrical Installation	10 months
5	Commissioning and Testing	4 months

3.2 PLANT

Equipment to be used during the construction of the facility will be typical for a project of this scale. In general the following machinery will be used:

- Loader
- Scraper
- Mobile crane
- Backhoe
- Excavator
- Grader
- Roller
- Piling hammer
- Skid steer loader
- Vibratory compactor
- Haulage Vehicles
- Delivery and vehicles for concrete and materials.

Heavy vehicle movements to the site are expected to consist predominantly of plant and material deliveries. The majority of machinery associated with the construction phase is likely to remain onsite for the duration of the construction process. Therefore, the traffic associated with heavy plant will be limited to their delivery and removal, with the intervening period comprising internal movements within the site.

It has been estimated that during the course of an average day during construction, approximately 15 trucks will access the site to either deliver materials or remove waste. These will be spread over the course of the working day.

3.3 DURATION AND PHASING

3.3.1 Phase 1: Site Evaluation

Prior to commencement of construction, geotechnical investigations such as trial pits and C.B.R. tests will be conducted to verify foundation designs and road construction. All investigations required prior to enabling works shall be carried out in accordance with BS 5930 (Code of Practice for Site Investigations).

3.3.2 Phase 2 Site Preparation and Clearance

There are no areas of land to be acquired prior to construction, as the applicant is in possession of the entire area bounded by the red line as illustrated in Figure 2.7 and Planning Drawing Reference Number C007335-04. This phase of construction will not commence until the main construction contract is awarded and will initially comprise clearance of conifer woodland in north-west area of the site, fencing, excavation, re-grading and landscape berming and planting. The site clearance works will be undertaken in accordance with best practice. Removal of the conifer woodland patch in the north western area of the site will be undertaken outside the bird breeding season (1st March until the 31st July) to mitigate disturbance to birds. Mitigation measures to avoid and limit impact to flora and fauna include; implementation of an environmental management plan which will address water run off and noise and dust generation, implementation of a suitable landscaping strategy to compensate for habitat loss and to benefit the wildlife of the local area, retention of hedgerows and treelines along the boundary of the site, etc. Also site clearance will proceed only after cognisance is made to the ecological mitigation measures as detailed in Chapter 10, Flora and Fauna.

As the site is flat there will be limited requirement for *cut and fill* activity. The proposed finished floor level (FFL) of buildings on site will be constructed 500mm above the estimated 100 year flood level of the Silver River, 46.85mOD (Malin). This FFL was determined following completion of a flood assessment for the site, refer to Chapter 9, Hydrology. Where cutting or excavation is carried out, this material will then be reused, if possible, in areas of the site where fill is needed or in areas requiring landscaping. All existing concrete hardstanding materials will be crushed on site for re-use on site as sub-base or berm materials. If any additional material is required this will be imported into the site in a safe and controlled manner, so as to minimise the potential for nuisance and disturbance.

As the site is considered brownfield should any localised ground contamination be encountered it will be dealt with and removed off site by a specialist licensed contractor. Lumcloon are committed to ensuring that all the necessary mitigation measures are implemented. Haul roads, internal construction site roads, main drainage runs, temporary car-parking and staff facilities will also be constructed during this phase. Such site preparation works are expected to take approximately 2 months.

Site preparation works will also involve the site set up by the building contractor, which will include provision of the following items:

- Site Office
- Site Facilities (canteen, toilets etc.)
- Office for Resident Engineer
- Secure compound for the storage of all on site machinery and materials
- Carparking
- Permanent/temporary fencing
- Site Security.

Construction traffic will enter the site via the existing site access road. A site compound will be installed near the site entrance to facilitate staff parking and site offices. Traffic related issues are further discussed in Chapter 14.

3.3.3 Phase 3: Civil and Structural Works

This phase will comprise the construction of the buildings, bunds, roads completion, drainage and infrastructural works completion. It is anticipated that the power generation building will be constructed on piled foundations. The foundations will be designed to withstand vibrations from turbine operations. The power generation building will be steel frame with a combination of masonry and metal cladding chosen to conform to safety requirements and minimise visual and noise impact. It is anticipated that these works will be undertaken over an approximately 20 month period. Large items of plant /equipment will be installed during this phase.

3.3.4 Mechanical and Electrical Installation

Mechanical installation will include gas and steam turbines, heat recovery steam generators, air cooled condensers and associated pipework. These components will be delivered to the site by the preferred supplier and will be installed in accordance with manufacturer requirements. All pipeworks and ducting will be assembled on site. The electrical installation will include transformers, wiring and cabling from the generators to the switchyard.

3.3.5 Phase 4 Installations and Commissioning

This phase will comprise the installation and testing of mechanical and electrical equipment. It is anticipated that the duration for the installation and testing works will take approximately four months. During this phase final completion and finishing works will be carried out in anticipation of handover of the project to the client.

It should be noted that the above is indicative only and may be subject to variations on consent from the planning authority and also to final schedule agreement with the main contractor.

3.4 EMPLOYMENT

Employment levels across the project will vary depending on the construction programme and the extent of activities occurring on the site. It is expected that during peak activities, there will be up to 400 construction workers at the site. It is anticipated that during peak construction periods, approximately 200 vehicles will enter the site in the morning and leave the site in the evening. This is based on vehicle occupancy of two. An assessment of the likely traffic volumes which may arise during the construction and operational phase are discussed in Chapter 14, Roads and Traffic.

3.5 ACCOMODATION/FACILITIES

The relevant statutory requirements will be provided for all workers on the construction site including:

- Canteen facilities and drinking water supply
- Toilet, wash up and locker facilities and hot water
- Drying room
- Car parking for workforce
- First Aid Office
- Site Engineers & Resident Engineers offices
- Site offices for Contractors
- Secure site compounds.

3.6 CONSTRUCTION OPERATION HOURS

Subject to agreement with the planning authority, it is anticipated that the following times will constitute the standard working hours on the construction site.

- Monday to Friday 07:00 to 19:00
- Saturdays 08:00 to 16:00 pm
- Site closed on Sundays
- Site open on Bank Holidays as per Saturdays

Working hours may vary slightly depending on weather conditions and daylight hours during winter months. Heavy construction activities will be avoided where possible outside the normal working hours outlined above.

3.7 CONSTRUCTION TECHNIQUES

The construction techniques used will be standard and similar to those that would normally be associated with a large industrial project of this nature with both a building and technology installation element and a large civil engineering element.

3.8 MATERIALS

In so far as possible, construction materials will be from local sources to support the local economy and minimise environmental impact associated with vehicle emissions. All imported material that will be used on site will be retrieved from approved sources.

3.9 PIPING AND DRAINAGE WORKS

The construction of the foul and surface water systems will be an important element of the project. Temporary settlement ponds and interceptors will be constructed during the initial stages of the contract mitigating against adverse impacts on the existing drainage network.

3.10 EXTENSION OF INFRASTRUCTURE

Services such as ESB and Telecom will be brought to the dedicated construction compound from the nearest available point. Potable water for the development will be supplied from the existing group water scheme located at the front of the site. Temporary sanitary accommodation will be provided on site. All domestic effluent generated on site will be discharged to temporary sewage containment facilities prior to transport and treatment off site.

3.10.1 Waste Management

During the construction phase both solid and liquid waste will be produced at the facility. Waste oils, solvents and paints will be stored in a temporary bunded area prior to transport off site by a licensed contractor.

It is not envisaged that there will be any spoil materials arising from construction, as all the excavated soil will be re-used as part of the construction process. All other solid waste generated during the construction phase will be adequately segregated and stored prior to transfer to an authorised facility for recovery/recycling/disposal.

3.11 FENCING AND SECURITY

Temporary fencing will be erected around the site compound. All on site machinery and materials will also be stored within the fenced compound.

3.12 NOISE, VIBRATION AND DUST

Dust emissions during the construction period have been detailed under temporary environmental protection measures. A construction management plan will be prepared and put in place for the construction of the development. This will include measures and trigger values to mitigate any potential impacts to nearby receptors. In addition noisy construction works will be limited to 8am to 6pm weekdays with Saturday working from 8am to 1pm. Baseline and proposed noise emission levels have been presented in Chapters 11, Air and Chapter 13, Noise of the EIS.

3.13 TEMPORARY ENVIRONMENTAL PROTECTION MEASURES

During the construction stage site construction roads will be sprayed with water during dry periods to mitigate against the formation of dry dust particles. Excavated materials stored or moved on site could lead to the formation of airborne dust particles during dry weather periods. Water suppressants will be used during these dry weather conditions.

The landscaping areas proposed for the facility will be constructed and planted at the earliest opportunity thus limiting the potential for off site migration of airborne dust. Where temporary stockpiles are required the material will be stored in designated areas and will be covered with tarpaulins and/ or regularly dampened during dry weather periods.

All potentially polluting substances such as oils, chemicals and paints used during construction will be stored in designated storage areas. These will be bunded to a volume of 110% capacity of the largest tank/container within the bunded area with all filling and draw-off points fully located within the bunded area. Drainage for the bunded area will be diverted for dedicated collection and safe disposal.

As stated above all domestic effluent generated on site will be discharged to temporary sewage containment facilities prior to transport and treatment off site.

Temporary settlement ponds and interceptors will be constructed as necessary during the early stages of construction mitigating against silt laden run-off to the existing drainage network.

3.14 POTENTIAL IMPACTS

Prior to commencement of development a construction quality assurance plan (CQA) will be jointly prepared by the contractor and developer. Written approval of the CQA will be sought from the planning authority prior to site development.

Good housekeeping and facility management during the construction period will ensure that there will be no negative environmental impacts from the construction of the proposed facility.

As stated previously in this section, the majority of machinery associated with the construction phase is likely to be onsite for extended periods of time. The traffic associated with these will therefore be limited to their delivery and removal, with the intervening period involving internal movements within the site. The impact of these on the surrounding road network is therefore expected to be minimal and infrequent.

4.0 HUMAN BEINGS

4.1 INTRODUCTION

This chapter of the EIS considers and accesses the cumulative potential impact of the proposed development on the people and communities living and working in the general vicinity of the proposed development. Human beings interact with all elements of the environment and specific impacts of traffic, air quality, noise, visual environment and material assets are addressed in more detail in their individual chapters.

4.2 METHODOLOGY

In accordance with the EPA 'Advice Notes on Current Practice (in the preparation of Environmental Impact Statements'), 2003, this chapter has considered the 'existence, activities and well being of people' with respect to 'topics which are manifested in the environment such as new landuses, more buildings or greater emissions'. Issues examined in this section include:

- Economic Activity
- Employment
- Social Consideration
- Land Use
- Health and Safety

These issues and the receiving environment baseline study are detailed below.

4.3 RECEIVING ENVIRONMENT

The subject site is located in the townland of Lumcloon, a rural area characterised by flat topography. The site of the proposed development has been used for a power plant since 1957 and the presence of a power plant at this stage is part of the character of the area. This is reflected by a number of locals living in close proximity to the site writing to the developers supporting the proposed power plant. There are large parcels of cutaway bogland and forestry to the south west and north-west of the site and the industrial railway lines associated with the former peat power station run out from the site to the surrounding boglands. Settlement in the area is sparse with once off rural housing generally located along roadsides and larger houses associated with farmsteads set back off private lanes. Groupings of properties are occasionally found at road junctions.

The townland of Lumcloon is in the electoral area of Ferbane which is in the electoral division (ED) of Gallen. The study area for the purpose of this report includes an assessment of the townlands in the electoral division of Gallen, as identified in Table 4.1.

Table 4.1 Townlands in the Electoral Division of Gallen

• Coolnahinch	• Noggusduff
• Glyn	• Gallen
• Ballysheil	• Gallen View
• Smithstown	• Falsk
• Cush East	• Derrycarney
• Noggusboy	• Lumcloon
• Rin	• Bun

The proposed development is located in close proximity to other settlements such as Ferbane located 5km north of the site, Athlone 22km north of the site, Birr 15km south of the site, Tullamore 20km east of the site and Ballinasloe 33km west of the site. However, for the purpose of this assessment the study area relates to the electoral division of Gallen only.

4.3.1 Trends in Population

CSO data provides details on recent trends in population within the study area over a four year period i.e. from 2002 to 2006 as illustrated in Table 4.2. During this period the population increased by 5 % in the study area, which is low when compared to the 8% national growth experienced in the area and 11% growth in Co. Offaly.

Table 4.2 2002 and 2006 Population of the Study Area

	2002	2006	% increase
State	3,917,203	4,239,848	8%
County Offaly	63,663	70,868	11%
Study Area	627	597	5%

4.3.2 Age Structure

4.3.2.1 Dependency Ratio

The study area age structure can be summarised in terms of the dependency ratio and the economically active age groups. The dependency ratio expresses the percentage of population in the 0-14 and 65 years and over age cohorts. In County Offaly in 2002 the dependency ratio was 35% comprising 23% and 12% respectively in the under 15 years and over 65 years age cohorts. In County Offaly in 2006 the dependency ratio decreased slightly to 34% with 23% and 11% respectively in the under 15 years and over 65 years age cohorts.

The comparative dependency rates in the study area were 40% and 41% in 2002 and 2006 respectively thus showing a slight increase, which is significantly higher than County Offaly.

4.3.2.2 Economically Active

The *'Economically Active'* group includes persons in the age groups 15-64 years. It should be noted that not all of those in this group would be economically active in the work place. Many in the 15-25 year cohort would be in continuing education, others, for example would be classified as being on home duties. The percentage of economically active in the study area in 2002 and 2006 was 60% and 59% respectively which was below the county average of 65% and 66% in 2002 and 2006 respectively.

Table 4.3 Percentage Distribution by Age Group within the Study Area

	2002				2006			
	Actual		%		Actual		%	
	Co. Offaly	Study Area	Co. Offaly	Study Area	Co. Offaly	Study Area	Co. Offaly	Study Area
0 – 14	14,799	126	23	21	15,957	113	23	19
15 – 24	9,791	104	15	16	10,090	88	14	15
25 – 44	18,341	144	29	23	21,673	128	30	21
45 – 64	13,340	133	21	21	15,390	139	22	23
65+	7,392	120	12	19	7,758	129	11	22
Total	63,663	627	100	100	70,868	597	100	100

Table 4.4 Dependency Ratio and Economically Active within the Study Area

	2002		2006	
	Co. Offaly	Study Area	Co. Offaly	Study Area
Dependency Ratio	35	40	34	41
Economically Active	65	60	66	59

4.3.3 Households

4.3.3.1 Definition

A private household is defined as a group of persons living together (usually but not necessarily related), jointly occupying the whole part of a private dwelling house, flat, or temporary dwelling and sharing a common budget.

A non-private household is a boarding house, hotel, guesthouse, barrack, hospital or nursing home, school, religious institute, prison or similar establishments. Proprietors, managers, owners and staff of such establishments who with their families occupy flats on the premises are classed as private households.

4.3.3.2 Private Permanent Households

Between 2002 and 2006 the number of private permanent households in County Offaly increased by 18% rising from 20,144 to 23,769. The number of persons in private households also increased in County Offaly rising by 11.6%. In comparison although the number of households in the study area increased by 1.8% between 2002 and 2006 the number of persons in private households decreased by 5% from 563 to 535.

Table 4.5 Numbers of Permanent Private Households, 2002 & 2006

	2002	2006	increase/ decrease
Number of households, Study Area	167	170	+ 1.8%
No. of households, Co. Offaly	20,144	23,769	+ 18%

Table 4.6 Number of Individuals Residing in Permanent Private Households, 2002 & 2006

	2002	2006	increase/ decrease
Persons in private households, Study Area	563	535	- 5%
Persons in private households, Co. Offaly	62,258	69,498	+ 11.6%

4.3.4 Employment

Recent trends in employment were evaluated using CSO Small Area population Statistics, (SAPS) information. The information was complied on the basis that:

- The Labourforce is defined as the sum of people aged 15+ who are at work and who are unemployed
- The participation rate is the proportion of persons in the workforce aged 15 and over expressed as a percentage of all persons in that age group
- The unemployment rate is the proportion of all people unemployed expressed as a percentage of all persons in the labour force

Table 4.7 Employment Figures

	Persons aged 15+		At Work		Unemployed		Labourforce		Participation Rate		Unemploy. Rate of Workforce	
	'02	'06	'02	'06	'02	'06	'02	'06	'02	'06	'02	'06
Study Area	501	484	199	209	20	29	219	238	39.7	43.2	9.1	12.2
Co. Offaly	48,864	54,911	25,599	31,231	2,459	2,903	28,058	34,134	57.4	62.2	8.7	8.5

The findings illustrate that the unemployment rate within County Offaly in 2006 was 8.5% which is a slight decrease upon the 2002 statistic of 8.7%. Unemployment within the study area in 2006 was 12.2 % which is an increase upon the 2002 statistic of 9.1 % and is high in comparison to the national average in 2006 of 8.5%.

4.3.5 Persons at Work by Industry

The combined total number of people at work within the study area in 2006 was 209 out of a labourforce of 238. The two largest employment sectors within the study area are:

- Manufacturing, which accounts for 45 people and
- Building and Construction, which accounts for 28 people

In the four year period from 2002 to 2006, employment in manufacturing, clerical and office workers transport workers and professional workers decreased. Increases in employment rates were noted in the four sectors, farming, fishing and forestry managers, other agricultural workers, sales workers and other workers.

Table 4.8 Distribution of Employment Sectors within the Study Area

Employment Sector	ED	
	2002	2006
Farming, fishing & forestry managers	13	18
Other agricultural workers	2	6
Manufacturing workers	53	45
Building & Construction workers	26	28
Clerical and office workers	16	10
Administrative and Government workers	10	10
Transport workers	8	7
Sales workers	14	23
Professional workers	29	20
Service workers	14	16
Other workers	14	32
Totals	199	209

4.3.6 Social & Community Facilities

Social and community facilities located in the study area are detailed below. Community organisations in the study area include:

- Lough Boora Parklands Group
- Ferbane Tidy Towns
- Ferbane Womens Group
- Ferbane Foróige Club

Schools located in the study area include:

- Scoil Mhuire Cailini, Ferbane
- Sn Muire Buachailli, Ferbane
- Gallen Community School
- St Marys National School, Cloghan
- Lumcloon National School, Cloghan

4.3.7 Heritage & Amenity

Recent efforts have been made in the area to introduce tourism related land-uses on less damaged or restored peatland areas. This includes the Lough Boora Parklands and the promotion of designated walking routes on the Grand Canal Way and the Offaly Way.

A key feature of the local landscape is the Lough Boora Parklands. The Lough Boora Parklands Group run a number of projects within the parklands the aim of which is to create recreational areas and wildlife habitats in large tracts of cutaway peatlands. The public parklands comprise wetland areas, fishing lakes, deciduous and coniferous forestry, pastureland, over 50km of walkways and a sculpture park containing a number of permanent and large scale exhibits. The closest part of these Parklands lies approximately 3km to the east of the site.

The site is located approximately 17km from the historic monastery at Clonmacnoise, which is a pilgrimage and tourist destination.

The site borders the R357 road to the immediate north of the site which is part of the R357 Blueball to Shannonbridge Scenic Amenity Route. This section of the road is considered part of a potential tourism route approach route to Clonmacnoise to the north west.

A list of the proposed Natural Heritage Areas, Waymarked Ways and Public Parks in proximity to the study area is included below;

- Proposed Natural Heritage Areas;
  - Grand Canal pNHA – located 2km north of the site at its closest point.
  - Lough Boora pNHA – located 2.5km to the south east of the site at its closest point.

- Waymarked Ways;
  - The Offaly Way – part of this Way traverses the landscape to the east of the site, from Kilcormac, through Lough Boora Parklands towards the Grand Canal.

  - The Grand Canal Way – this route runs along the Grand Canal, approximately 2 km north of the site at its closest point.

- Public Parks;
  - The Lough Boora Parklands Complex comprises a number of publicly accessible parks in the study area with the closest approximately 3km from the site. This includes the archaeological site at Lough Boora Mesolithic Site.

4.3.8 Tourism

The proposed development is in proximity to the towns of Tullamore (23 km east of the site) and Birr (21 km south of the site) which are in *A Tourism Strategy for County Offaly* and Offaly County Council recognises that both towns are critical to establishing strong economic links with other tourist areas in the county and Midland Region in its entirety.

Offaly County Council has established a network of walking routes that are located in County Offaly or are passing through the County. These walks have been divided into a number of categories and encompass a snapshot of the County's landscape but are mainly focused on the Slieve Bloom Mountains. As mentioned previously the Offaly Way is located to the east of the site and is a linear route linking the Slieve Bloom Way to the Grand Canal Way, located approximately 2km north of the site at its closest point. It includes areas of mountain and riverside as well as long stretches of bogland. The route has ecclesiastical and prehistoric interest.

As mentioned above the Lough Boora Parklands, the closest part of which lies approximately 3km to the east of the site, is an important tourist area with public parklands comprising of wetland areas, fishing lakes, deciduous and coniferous forestry, pastureland, over 50km of walkways and a sculpture park containing a number of permanent and large scale exhibits. They have been well promoted on tourist sites and have instigated an increase in visitor numbers to this area.

4.4 IMPACT ASSESSMENT AND MITIGATION MEASURES

4.4.1 Economic Activity

As outlined in Section 3, Construction, it is expected that during peak construction activities, the site will employ approximately 400 persons working directly on the construction of the facility. The construction phase will take approximately two years.

The number of employees working in the building and construction sector within the study area in 2006 was 28 people, therefore it is anticipated that this proposed development will significantly increase the numbers of employees in this sector in the short term. Furthermore, the permanent employment of 45-50 people within the proposed facility during operation will have a positive impact on the manufacturing sector in the long-term. This will help to increase employment in the manufacturing sector which has witnessed a decrease in the four year period from 2002 to 2006.

It is envisaged that money generated during the construction phase alone will have an immense benefit to the community and the village of Lumcloon as well as the wider area with respect to expenditure on local goods, services and accommodation. As a result a number of indirect jobs will be created in the service industry during the construction phase.

As noted above, it is estimated that approximately 45-50 personnel will be employed in a full time capacity at the proposed facility during operation. A number of indirect jobs will be created in the service industry in the local area to facilitate the development. It is considered that the revenue generated from the additional employment within the study area will result in additional significant monies, which will have positive impact on local service demand, accommodation etc in the long term resulting in increased expenditure within the locality.

Where possible, local residents will be employed during the construction phase of the proposed development and a number have already made enquiries about employment opportunities. As a result, it is anticipated that during the construction phase the proposed development will increase employment within the study area and introduce related expenditure into the economy as detailed above.

4.4.2 Social Considerations

The project will make a major contribution to the region through foreign direct investment, new employment and annual rates to the local authority. During the two year construction phase the project will provide a boost to the local economy:

- Approximately 400 new jobs will be created during construction of the development
- Steel, concrete and building materials will be sourced locally
- Demand for house lettings and B&B's will increase
- Shops, pubs and restaurants will benefit creating a number of indirect jobs

When the plant is in operation:

- 45-50 high-end jobs will be created
- Derelict site will be redeveloped into a State of Art Power Plant
- Local subcontractors will be required creating a number of indirect jobs

Impacts upon society as a result of this development have been considered in detail in this EIS. Detailed descriptions of the effects, residues and emissions associated with the facility are presented in Sections 5-17 under the following headings:

- Planning and Policy
- Landscape and Visual Impact
- Soils & Geology
- Groundwater
- Hydrology
- Flora & Fauna
- Air Quality
- Climate
- Noise
- Roads and Traffic
- Archaeological, Architectural and Cultural Heritage
- Material Assets
- Interactions

4.4.3 Landuse

Lumcloon Energy Ltd, intends to apply for full planning permission for the development of a 350MW Gas Fired Power Plant on lands owned by Lumcloon Energy Ltd. in the town land of Lumcloon, Ferbane County Offaly (Figure 1.1, Site Location Map). The proposed facility will be located on an area of 11 acres. This environmental impact assessment evaluates the site in its entirety.

As outlined in Section 16, Material Assets, there will be no severance of land as a result of the proposed development or loss of rights of ways or amenities or rezoning of land required. The proposed development will be constructed on Lumcloon Energy Ltd. lands only and not on any other agricultural lands, therefore a statistical farm survey, which would evaluate land take or severance factors, was considered unnecessary. Cognisance of the impact that this development will have on the environment as a whole has been evaluated in Section 5-17.

4.4.4 Health & Safety

4.4.4.1 Construction Stage: Potential Impacts

The construction of all facilities can give rise to an impact on the health and safety of human beings if such activities are not managed in an appropriate manner. During the construction stage of this project there is a potential impact on the health and safety of human beings due to the increased volume of traffic accessing the site and the typical health and safety issues associated with any construction site such as slips trips and falls, etc. There is a low risk of nuisance levels of dust and noise being generated on site and impacting in a minor way on the health and safety of human beings. There is a low risk that persons visiting the site or accessing the site illegally during the construction stage may potentially be subjected to a range of impacts on their health and safety associated with construction sites.

4.4.4.2 Operational Stage: Potential Impacts

The operation of industrial facilities can give rise to an impact on the health and safety of human beings if such undertakings are not managed in an appropriate manner. The health and safety of persons working at the facility and those off site may be affected by a range of hazards associated with industrial facilities of this type.

Under S.I. No. 74 of 2006 (the Seveso/COMAH Regulations) the planned diesel storage capacity at the facility means that the power plant will be classified as a lower tier Seveso site and must provide certain information to the "Central Competent Authority". The Health and Safety Authority (HSA) is designated as the Central Competent Authority under the Seveso Regulations. The proposed gas turbines are of types for which the Planning Authority is obliged to seek technical advice from the HSA. A Major Accident Hazards (MAH) Report has been prepared and is contained in Appendix 4.1. The report identifies all of the major accident hazards in the facility and includes an assessment of the extent and severity of the consequences of such accidents.

The potential hazards which have been identified consist of the following;

- Storage of dangerous substances
- Gas releases
- Diesel releases
- Turbine disintegration
- Transformer explosion
- Damage due to vandalism/terrorism

- Aircraft impact
- Ground movement
- Offsite fire

The potential consequences of the above hazards are assessed as part of the Major Accident Hazards Report and the results show that no normally occupied locations (residential, school or industrial) will be exposed to significant hazard effect levels as a result of operations at the facility. The report concluded that the operation of the facility would not pose undue risks either to the surrounding population or to workers in the facility.

4.4.4.3 Mitigation Measures

The construction stage of the project will be managed in accordance with the *Safety, Health and Welfare At Work (Construction) Regulations 2006,* the *Safety, Health and Welfare at Work Act, 2005 and* any associated Codes Of Practice and international best practices for projects of this type.

A Project Safety Plan will be developed to ensure that the safety of human beings is not impacted on in a negative way by the construction works. Nuisance noise and dust levels on site will be kept to a minimum. The site will be adequately secured to prevent unauthorised access and all visitors to the site will be required to report to the site manager. When implemented these mitigation measures will not have any additional negative impact on the health and safety of human beings. A construction project supervisor and a safety coordinator will be appointed in accordance with the *Construction Regulations, 2001* and will be on site during the construction phase of the proposed development. This person will have responsibility for ensuring that relevant health and safety legislation is adhered to and that recommended mitigation measures are implemented.

When implemented these mitigation measures for the construction phase will not have any additional negative impact on the health and safety of human beings.

The mitigation measures incorporated into the facility to prevent potential hazards being realised or to mitigate their consequences should they occur are outlined in the Major Accident Hazards Report in Appendix 4.1.

4.5 RESIDUAL IMPACTS

Strict adherence to the mitigation measures recommended in Sections 5 to 16, will ensure that there will be no negative environmental impacts or effects on Human beings from the construction and operation phases of the proposed development.

4.6 REFERENCES

- Environmental Protection Agency (2003). *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements*. EPA, Wexford, Ireland.

- Environmental Protection Agency (2002). *Guidelines on the information to be Contained in Environmental Impact Statements.* EPA, Wexford, Ireland.

- Central Statistics Office (CSO) 2002 and 2006. *Small Area Population Statistics (SAPS).* CSO, Dublin 6, Ireland.

- Offaly County Council (2008). *Offaly County Development Plan 2009 – 2015*, Offaly, Ireland.

5.0 PLANNING AND POLICY

5.1 INTRODUCTION

This chapter provides an overview of the national, regional and local land use planning policy context for the proposed development. The development is reviewed in the context of the following

- Planning History of the Site
- National Development Plan, 2007-2013
- National Spatial Strategy, 2002-2013
- Delivering a Sustainable Energy Future for Ireland, 2007
- Midlands Regional Planning Guidelines, 2004-2010
- Offaly County Development Plan, 2009-2015

5.2 PLANNING HISTORY OF THE SITE

As discussed in Chapter 2, Project Description, the ESB operated a peat fired power plant at the site between 1957 and 2001, which was decommissioned by 2004. The ESB subsequently applied for and received planning permission in 2004 from Offaly County Council for a 100MW simple cycle gas turbine power plant at the site. The ESB decided not to pursue plans to redevelop the site due to deregulation and other changes in the electricity supply market in Ireland. The following is a list of planning applications lodged by the ESB between 1986 to present with Offaly County Council associated with the previous peat fired power station at Lumcloon. It should be noted that the proposed development site is only part (11 acres in the northern area) of the former site which operated by the ESB as a power generation facility.

Planning Ref	Lodged Dated by ESB	Decision
86240	14/05/1986	Conditional
91330	01/10/1991	Conditional
98521	30/06/1998	Conditional
99759	06/07/1999	Conditional
03802	31/07/2003	Conditional
031196	14/11/2003	Incomplete Application
031281	03/12/2003	Conditional
081028	09/12/2008	Conditional

The above planning applications relate to alterations works to the former ESB power generation plant during its operation and post decommissioning.

In 2003 it was publically announced that Combined Energy Technology (CET), a waste disposal company, planned to apply for planning permission to construct a waste incineration facility at the site in Lumcloon. CET proposed to process meat and bonemeal produced in Ireland at the facility. Following strong local public opposition to the project, the developers decided not to proceed with the project and the planning application was withdrawn.

Conditional planning permission was also granted by Offaly County Council to Lumcloon Partnership on 16th May 2008 (Planning Ref. 071732) for the construction of six industrial warehouse units, refurbishment of one existing building and associated development to comprise an enterprise park. This site adjoins the Lumcloon Energy site to the south and is 7.7 hectares in area. Construction of this development had not commenced at the time of lodging this application.

The proposed development by Lumcloon Energy continues the tradition of power generation at the site and it should be noted that the proposed plant has a significantly smaller footprint, is a more efficient power plant and will have a significantly lower greenhouse gas emissions per unit of energy produced when compared with the former peat fired power plant.

5.3 RELEVANT PLANS AND POLICY

5.3.1 National Development Plan, 2007-2013

The Energy Programme of the National Development Plan 2007-2013, encompasses approximately €8.5 billion in investment in energy over the period of the Plan. It is stated in the plan that the overall strategic objective of the Energy Programme is to ensure security of energy supply nationally and regionally, which is competitively priced, in the long term while meeting a high level of environmental standards.

The NDP highlights that the population of all of the eight Regional Authority areas of the State is growing and at rates higher than for the previous inter-censal period. The greatest increases (% annual growth rates) took place in the Mid-East Region (3.6%), the Midlands Region (2.8%), the South-East Region (2.1%), the West Region (2.1%) and the Border Region (2%). With a predicted growth in population the country will therefore require additional energy infrastructure to meet the predicted increase in demand.

5.3.2 National Spatial Strategy, 2002-2020

The National Spatial Strategy (NSS) is a twenty year national planning framework for Ireland. The NSS aims to achieve a better balance of social, economic and physical development across Ireland, supported by more effective planning. While the 2000-2006 National Development Plan identified Dublin, Cork, Limerick/Shannon, Galway and Waterford as existing gateways, the NSS designated four new national level gateways including the midland towns of Athlone/Tullamore/Mullingar. The current NDP (2007-2013) is aligned with NSS policies which prioritise and encourage more balanced regional development.

The NSS recognises the liberalisation of the electricity market in Ireland, which permits new generation plants, which may not be owned by the ESB, to connect to the electricity network. The NSS outlines that there is investment and improvement opportunity for power generation plant in the midlands near existing transmission infrastructure. The Strategy also states that 'the critical mass of the Midlands and its pull factors will need reinforcement to support indigenous growth and attract investment'.

As outlined by Eirgrid in their Grid Development Strategy, Grid 25, government policy and high probability areas for locating future conventional generation include brownfield sites and sites close to the gas network.

5.3.3 Delivering a Sustainable Energy Future for Ireland, 2007

In March 2007, the government published an Energy Policy White Paper entitled *Delivering a Sustainable Energy Future for Ireland*, as a comprehensive action-based energy policy framework covering the period to 2020. It contains over 200 actions focused on delivering a range of strategic goals to underpin the sustainability, security of supply and competitiveness of the Irish energy sector and on driving delivery with integrated structures and strong policy capabilities. The Government's energy policy and climate change goals are also closely aligned and are reflected in the Climate Change Strategy.

The Government's primary policy objective is *'to ensure that energy is consistently available at competitive prices with minimal risk of supply disruption'*. This Energy Policy White Paper outlines the following strategic goals to underpin the government's overriding objective:

- Ensuring that electricity supply consistently meets demand
- Ensuring the physical security and reliability of gas supplies to Ireland
- Enhancing the diversity of fuels used for power generation

- Delivering electricity and gas to homes and businesses over efficient, reliable and secure networks
- Creating a stable attractive environment for hydrocarbon exploration and production
- Being prepared for energy supply disruptions

In recent years, new generation capacity being added to the system primarily comprises gas fired combined cycle gas turbine (CCGT) plant and wind powered generation plant. The capacity credit of wind is relatively low by comparison with conventional plant and declines as wind penetration increases. The capacity credit of a generation unit is defined by Eirgrid as *'a measure of its contribution towards generation adequacy'* (i.e. maintaining the demand supply balance). The government has committed to a renewable electricity target of 40% wind generation plant penetration by 2020. However as more wind power generation plants are added to the system the risk to a secure, competitive and reliable energy supply increases. This is due to the fact that the capacity credit of wind generation plant is limited because of variable meteorological conditions (produces approximately 35% of that which might be expected under perfect wind conditions). Additionally, although geographically distinct, wind generation plant output is linked as it is often the case that common wind conditions exist across the country. Therefore increased wind generation penetration does not correspondingly result in increased output /capacity. Therefore, it is essential in a regime of greater variability, that new flexible, reliable and reactive (can start up and stop rapidly) conventional generation plants are installed to maintain a secure and competitive energy supply. The proposed Lumcloon plant is designed to meet the generation needs as required by the transmission operator and ensure that Ireland can meet its renewable targets and the government's primary energy policy objective, as outlined in the Energy Policy White Paper.

5.3.4 Midlands Regional Planning Guidelines, 2004-2010

Regional Planning Guidelines (RPG) by the Regional Authorities, setting the strategic policy agenda for Local Authority development plans at city and county level. Regional Guidelines are prepared as a framework to ensure good alignment between public investment plans at national level and physical planning at regional and local levels.

The Midland Regional Authority (MRA) has commenced the review of the current Regional Planning Guidelines for the Midland Region 2004 – 2010 and the preparation of revised Regional Planning Guidelines 2010 – 2016. The review commenced on Monday 2nd March 2009. In their Issues Paper for the Midland Region RPGs, 2010-2022, the MRA states that *'the successful development of the Midland Region requires the availability of adequate* sources of energy at affordable cost'. The MRA also say that *'electricity is the main energy* *demand in the Midland Region. An efficient, reliable and cost effective electricity supply is a key resource for regional development'*.

In their strategy document (*Grid 25)* for the Development of Ireland's Electricity Grid for a Sustainable and Competitive Future, Eirgrid predicts that the demand for electricity in the Midlands region will grow by over 40% by 2025 and the region is expected to have up to 160MW of wind energy capacity. As such, Eirgrid propose to invest an additional €310m in the midlands region upgrading the transmission network and new circuit build. Eirgrid state that this *'reinforcement is necessary to cater for the continued demand growth in the gateway towns of Athlone, Mullingar and Tullamore'*. Upgrading the network will also facilitate power flows from both conventional and renewable sources. The proposed plant at Lumcloon will provide a secure and reliable source of electricity in a region where Eirgrid are predicting a substantial growth in demand.

5.3.5 Offaly County Development Plan, 2009-2015

The Offaly County Development Plan, 2009-2015 acknowledges that County Offaly has a long tradition of power generation. In consideration of this, the Plan states that it is Council policy *'to facilitate the continuance of power generation stations within the county'*.

It is an objective of the Council *'to support and facilitate the generation of electrical power within the county and the provision of high-voltage electricity infrastructure to cater for natural growth, new and existing large customers'*. Furthermore, the plan states that *'it is an objective of Offaly Council to ensure, insofar as is possible, that the necessary infrastructure is in place to support the existing and future economy in Offaly, to support economic development and to attract investment'*.

The Plan also states that there are *plans for improvements in electrical infrastructure at Banagher and Lumcloon*. Improvement works to the existing transmission lines at the site in Lumcloon were commenced by the ESB in June 2009.

In Chapter 6, Employment Economy and Enterprise, of the Plan, it states that *'it is Council policy to actively encourage the redevelopment of brownfield sites for enterprise and employment creation throughout the county, in particular, disused sites which were formerly ESB plants and Bord na Mona works'*.

Chapter 20 of the County Development Plan discusses Council policy in relation to regeneration and renewal including reuse of derelict sites. The Plan expresses that it is Council policy to seek to encourage the redevelopment of sites (brownfield) as an alternative to building on new undeveloped sites.

5.4 SUMMARY

The proposed development is compliant with National, Regional and Local policy for proposed gas power generation development at Lumcloon, Co Offaly. The abovementioned policy documents are supportive of the development of efficient, flexible power generation plant on sites which are close to the gas and electricity networks, have a history of power generation and have the necessary service infrastructure to support the existence of the development.

6.0 LANDSCAPE AND VISUAL

6.1 INTRODUCTION

The landscape and visual impact (LVIA) assessment for the proposed development at Lumcloon, Co Offaly is discussed in this Chapter. This assessment considered the potential landscape and visual effects of the proposed Power Plant on the baseline resources of the application site and its surrounding area. The methodology of the assessment is outlined below followed by a detailed assessment of existing conditions, resource change, landscape and visual impact and recommendations for any mitigation measures for the proposal.

6.2 METHODOLOGY

A number of relevant documents and websites were reviewed to establish a specific approach and technique to the landscape and visual impact assessment. These include the following:-

- Guidelines for Landscape and Visual Impact Assessment (2nd Edition) by the Landscape Institute and the Institute of Environmental Management and Assessment 2002;
- National Parks and Wildlife Service of Ireland (NPWS), www.npws.ie;
- Offaly County Council – County Development Plan 2009-2015;
- The Environmental Protection Agency (EPA) '*Guidelines on the Information to be contained in Environmental Impact Statements*' and '*Advice Notes on Current Practice in the Preparation of Environmental Impact Statements*', published in 2002 and 2003.

All feasible and reasonable attempts have been made to ensure that the information provided by a range of public sector institutions and presented in this report is accurate and up-to-date. Park Hood is not responsible for accidental perpetuation of inaccuracies in these records and any consequent effect on the conclusions in this report.

6.2.1 Landscape and Visual Assessment Stages

The Landscape and Visual Assessment studies the potential effects of the proposed Power Plant and associated infrastructure on the visual resources of the site and its surroundings and the impact on the general landscape character of the application site and the surrounding midlands landscape. The methodology of the assessment is outlined below followed by a detailed assessment of existing conditions, resource change, landscape and visual impact and recommendations for any mitigation measures for the proposal.

6.2.1.1 LVA Stage One: Baseline Landscape Description and Evaluation

LVA Stage 1 sets out to describe, classify and evaluate the landscape character parameters of the study area and summarise the visual setting focusing on its sensitivities and ability to accommodate change.

This is established through a process of site surveys (undertaken between April and June 2009) and desktop study including searches of relevant internet sites, examination of current and historical maps and aerial photographs. The maps include those produced by Ordinance Survey Ireland "Discoverer Series" Sheets 47, 48, 53 and 54 and recently undertaken topographical site surveys of the application site itself.

Appraisal included evaluation of the quality, importance and value of the existing landscape and any interrelationships in the overall landscape patterns. Visual reference points were identified in locations open to public access in areas surrounding the site where there was either existing views or where there may be visual effects deriving from the proposal. The selection was also based on determination of the actual *visibility* of the site from key points or where there were significant numbers of likely visual receptors. Once evaluated and classified, it allows a level of importance to be attached and against this the changes can be assessed.

6.2.1.2 LVA Stage Two: Nature and Scope of Proposed Development and Mitigation Measures

LVA Stage 2 sets out to identify the key elements that make up the proposal and judge the likely sources of landscape character and visual effects arising from the development including any mitigation measures considered at design or construction stages and at completion.

6.2.1.3 LVA Stage Three: Statement of Significance of Effects on Landscape Character & Visual Amenity

LVA Stage 3 assesses the magnitude and significance of the changes to the landscape character and visual setting as a result of the development. The assessment of the existing landscape character is based on the subjective interpretation of the physical and aesthetic characteristics based on definitions and terminology described in the appendix.

The significance is dependant on the sensitivity of the affected landscape or visual receptor and the magnitude of change that is judged to have resulted from the development. Associated mitigation measures that may help to remedy any effects are also discussed.

Landscape Effects	The likely nature and scale of changes to individual landscape elements and characteristics. The consequential effect of the landscape character and quality, resulting from the proposal.
Visual Effects	The change in the character of the available views resulting from this proposal. The changes in the visual amenity of the receptors (i.e. those who will see it).

To consider the magnitude and significance of any change to the existing situation, the following issues were taken into account:-

- The sensitivity of the view takes into account both the public accessibility of the land where views are possible and the likely sensitivity of that view given the distance, travelling speed, intervening vegetation and land usage;
- The quality and value of the existing landscape at each Visual Reference Point (as determined above) were also taken into consideration in determining the effects
- The degree to which the proposal will be visible within the surrounding area;
- Any other changes in the existing landscape e.g. new road junctions.

6.3 EXISITNG LANDSCAPE CHARACTER

6.3.1 Site Location

The 11 acre brownfield site for the proposed Power Plant is located near Lumcloon, Co. Offaly on the R357 road, approximately 5km south of Ferbane, 20 km west of Tullamore and 22km south of Athlone, see Figure 6.1 attached.

6.3.2 Contextual Landscape Character

The place-name Lumcloon is derived from the Irish words *Lom* and *Cluain.* Lom means bare and Cluain meadow and this serves as a relatively good description of the contextual landscape within the Bog of Allen which is the largest complex of raised bog in Ireland, covering 370 square miles across the midlands. See Figure 6.2.

6.3.2.1 Landscape Characteristics

The key landscape characteristics can be summarised as follows:

- Distinctive flat, expansive landscape with large tracts of commercially cut peatlands;
- Minimal topographical variations across the surrounding landscape;
- Open commercial peatlands (associated with former or declining activities by Bórd na Móna) are linked by industrial features such as a narrow gauge industrial rail network and extensive drainage systems;
- Areas of cutaway peatland that comprise a combination of wetlands, lakes with bank areas subject to colonising scrub vegetation;
- Significant tracts of conifer forestry plantations at varying stages of maturity;
- Farmland, predominantly pastureland with significant areas of marginal less intensively managed fields bounded by straight mature hedgerows with occasional groups of mature trees;
- Straight main roads across bog-land areas that link into a network of narrow lanes and roads bound by hedgerows;
- Electricity pylons and transmission lines are notable features in this flat landscape.

In summary the landscape is very open, flat and expansive but would be described as being in transition on account of the industrial scale peat cutting operations undertaken on this land in the 20th century and the subsequent after-use including significant tracts of conifer forestry that form a mixed landscape pattern. Away from the peatland areas are open field areas that vary in quality depending on existing management. Recent efforts have been made to introduce tourism related land-uses on less damaged or restored peatland areas. This includes the Lough Boora Parklands and the promotion of designated walking routes on Grand Canal Way and The Offaly Way.

6.3.2.2 Settlement and Access

Settlement in this area is very sparse with infrequent single dwellings generally located along roadsides and larger houses associated with farmsteads set back off private lanes. There are significant areas devoid of any built elements. Groupings of properties are occasionally found at road junctions. The village of Ferbane (population c. 800) is located approximately 5.2km to the north on the River Brosna and its name is integrally linked with the former peat fuelled power station at the application site. The only other settlements of note within a 15km radius of the site are Banagher and Kilcormac.

The R357 Road traverses between Cloghan (4.5km due west) and Blueball (12km due east). The R437 Road runs from Kilcormac to meet the R357 approximately 1km west of the site. Other roads in the locality are narrow 3rd class lanes or local farm access tracks (typically concrete or gravelled). The main roads tend to be slightly elevated above the peatlands and traverse the landscape in a straight manner while lanes and tracks are confined by thickset hedgerows.

Located approximately 17km to the north-west is the historic monastery at Clonmacnoise (established 545 AD) which is an important pilgrimage and tourist destination attracting 300,000 visitors per annum. The Grand Canal (dating from 1756 to 1803) is located approximately 2km to the north of the application site.

Lough Boora Parklands

A key feature of the local landscape is the Lough Boora Parklands. The application site is located between this series of parklands which are projects instigated by the Lough Boora Parklands Group (since 1994) for creating recreational areas and wildlife habitats in large tracts of cutaway peatlands with a *'Green Tourism'* agenda. The public parklands comprise wetland areas, fishing lakes, deciduous and coniferous forestry, pastureland, over 50km of walkways and a sculpture park containing a number of permanent large scale exhibits. They have been well promoted on tourist sites and have instigated an increase in visitor numbers to this area though there is currently no Failte Ireland approved accommodation in this area. The closest part of these Parklands lies approximately 3km to the east of the proposed development site.

6.3.3 Landscape Character – Application Site

6.3.3.1 Land Use and Vegetation Cover

The current site is of a brownfield nature and is a flat area with remnant hard surfaces with small areas of peripheral woodland plantations that have matured. Incidental ornamental shrubs are located along the R357 Road in amongst more mature trees but these are somewhat out of context with the local landscape vegetation. Grasses and weed have colonised the open ground since demolition with taller scrub becoming established on peripheral areas. Hedgerows are located on most site boundaries. The area has not been subject to any land use or management for some time. See Figure 6.3.

The application site served as Ireland's first milled peat fired power plant operated by ESB. There are currently four 110 kV pylons to the west of the site and these are the only significant vertical elements that suggest the former land-use on this site. The most significant features were two reinforced concrete cooling towers that were 87m high with 56m diameter bases. These hyperbolic shaped towers were well known landmarks in the midlands landscape, Refer to Section 2.1.1.1. The built elements also included tall flues, plant and generating buildings making up the power plant but all traces were demolished by 2002, see Figure 6.4 attached.

A couple of sheds were retained just to the south of the application site area and these are of a utilitarian nature. Some materials storage is still facilitated on the site. Remnants of the light industrial railway are evident to the east of the site. The application site is set within a landscape predominantly in open pastureland that merges into extensive conifer plantations to the south and east and bound by vast areas of cutaway peatlands.

The site bounds the R357 Road to the north for approximately 350 linear meters with a single existing site access located off this straight section of road. There is no access to the application site area off the minor (unnamed and unnumbered) lane that abuts the western boundary of the site. There is an entrance just to the south of the application site that would have provided access to the former power plant. Both entrances are gated and locked to prevent access. Settlement in the local area is very sparse with properties limited to single detached properties or farmsteads. Approximately 12 properties are located within 1km of the application site and these are predominantly located to the south and west away from the commercial peatland areas.

6.3.3.2 Topography and Drainage

The application site appears very flat and levels vary between +45m on the west boundary to +47m on the eastern boundary. To the north, across the R357, the land falls slightly towards the Grand Canal, which flows west towards the River Shannon, but in overall terms this is a very flat landscape with very gradual, almost imperceptible variations in topography.

The Silver River flows along the eastern site boundary and there is evidence of a complex of historical drainage channels converging on this watercourse from the surrounding landscape areas. There is evidence on site of former engineered drainage system to facilitate surface water run-off during its operational period.

6.3.4 Landscape Designations

6.3.4.1 Development Plan Designations

The following designations pertinent to this site were identified in the Offaly County Council Development Plan 2009-2015. See Figure 6.5 attached.

Landscape Classification - Sensitivity Class	The application site is located in an area classified as "low sensitivity" which are summarised as areas that have "natural enclosing features (e.g. topography, vegetation) which have the capacity to absorb a range of new development". Beyond the application site, the wider peatlands including the Lough Boora Parklands carry a "high sensitivity".
Scenic Amenity Routes	The application site abuts the R357 Road to the immediate north of the site, which is a part of the R357 Blueball to Shannonbridge Scenic Amenity Route. This section of road is considered part of a tourist route approach to Clonmacnoise to the north-west.
Views & Prospects	Three "Views & Prospects of Special Amenity Value or Special Interest" are designated within the study area (V10, V11 & V12). These viewpoints are towards the Slieve Bloom Mountains or across the Bog of Allen and are not focused towards the application site or its peripheral landscape areas.
Landscape Designation - High Amenity : Lough Boora Parklands	The application site is located between the Lough Boora Parklands Complex designated as an Area(s) of High Amenity. This designation however, does not ingress onto any part of the application site.

6.3.4.2 Other Local Designations & Features

Other notable designations and features within the study area and of significance to the landscape character of the area are identified in National Parks and Wildlife Service of Ireland (NPWS) website or on local Ordinance Survey Discoverer Series Maps.

Proposed Natural Heritage Areas	Grand Canal pNHA (002104): located 2km north of the application site at its closest point. Lough Boora pNHA (001365): located 2.5km to the south-east of the application site at its closest point.
Waymarked Ways	The Offaly Way: Part of this Way traverses the landscape to the east of application site, from Kilcormac, through Lough Boora Parklands towards the Grand Canal. The Grand Canal Way: This route runs along the Grand Canal, approximately 2km north of the application site at its closest point.
Public Park	The Lough Boora Parklands Complex comprises a number of publicly accessible parks in the study area located around the application site. This includes the archaeological site at the Lough Boora Mesolithic Site.

6.3.5 Existing Visual Amenity and Visual Reference Points

Given the nature of the proposal, it is considered necessary to broaden the landscape evaluation to all areas that are likely to have views of the proposed Power Station rather than limit evaluation to the site itself. The evaluation includes a visual assessment from thirteen different Visual Reference Points (VRP) set at differing distances and elevations from the subject site. Grid Reference co-ordinates and elevations were taken with a GPS Coordinate System ETR589 Geodetic.

These points were selected based on the following:

- Site investigation to establish those locations where there was likely to be significant views (e.g. exposed and elevated ridges);
- Site investigation to establish those locations where there was likely to be a significant number of visual receptors (e.g. towns, tourist routes);

- Ensuring that all landscape character areas within the visual envelope of the site were covered to give representative potential visual effect;
- Study of the topographical data to ascertain areas likely to have most extensive views given scenarios such as no vegetation cover.

6.3.5.1 Views: North

To the north, across the R357 Road is a flat and open wide expanse of uninterrupted pasture and peatland known as Falsk that merges into formal blocks of commercial forestry. The R357 Road is aligned with thick hedgerows with significant tree groupings for the section adjacent to the site that ensure views of the floor of the application site and any buildings are obscured to areas further north. The most significant road is the R437 towards Ferbane that is a relatively narrow and unmarked road.

There are no properties located to the north of the application site, with the exception of a single farmstead near the road junction at the north-west corner of the site (VRP 06). The open expanse to the north has no properties or buildings until the Gallen townland or sparsely dispersed aside the Grand Canal, which is approximately 3km.

The settlement pattern becomes denser towards Ferbane, but the application site is obscured from these distant areas by intervening ridges and vegetation. The Grand Canal Way is on occasional elevated sections above the surrounding peatlands ensuring that open panoramic views are afforded. Although the application site is over 2km from the nearest part of the Canal, it is currently obscured from view by vegetation.

VRP 03	**R437 Road, (Railway Crossing) Nr Falsk**		
GPS Reference	N53 º13.532' H007 º49.266'	Elevation	+ 46m
Proximity to Application Site	1.8km	Photograph Date	14.05.2009
Comment on Visibility of Existing Site	Located just off the Falsk peatland area, this viewpoint represents the typical view afforded from the (slightly elevated) R437 Road as it traverses the flat landscape between Ferbane to the north to a junction with the R357 to the south. The application site is obscured from view by intervening scrub vegetation / conifer plantations.		

VRP 04	**R437 Road, Falsk**		
GPS Reference	N53 º14.359' H007 º49.173'	Elevation	+ 47m
Proximity to Application Site	2.5km	Photograph Date	14.05.2009
Comment on Visibility of Existing Site	To the north of the application site, the landscape is very flat and open with uninterrupted views of approximately 2km towards the vegetation and hedgerows aligning and in the vicinity of the R357 Road on the distant skyline. The application site is currently obscured by this vegetation. This is an indicative reference point from this large landscape area though there is little in the way of "visual receptors" in this landscape bar those who are working on the peatlands.		

VRP 06	**R357 Road Junction adjacent to NW corner of Site; (Designated Scenic Amenity Route)**		
GPS Reference	N 53 º13.664' H007 º47.900'	Elevation	+49m
Proximity to Application Site	10m	Photograph Date	26.05.2009
Comment on Visibility of Existing Site	The junction abuts the north-west corner of the application site where a small unnamed lane accesses the R357 Road. A mature woodland block serves to obscure views of the application site area. Some more ornamental planting is notable within the southern hedgerow on the R357 suggesting a former different land usage on the application site.		

6.3.5.2 Views: West

To the west the landscape is rural pastureland intersected by the R437 and R357 Roads that converge at Lumcloon Cross Roads. The fields and roads are bound by thickset hedgerows subject to varying management regimes but they serve to restrict views across the relatively flat landscape that rises very gradually towards Cloghan Hill (+114m), 4.8km distant.

The settlement pattern is very dispersed with occasional groupings of detached dwellings aligning the local road network. The closest properties on the R357 to the west (before Lumcloon) are set in mature vegetated areas and views towards the application site are obscured. The landscape is crossed by a series of major power-lines remnant from the former power plant at the application site. There are no views from the village of Cloghan.

VRP 01	R357 Road, Lumcloon; (Designated Scenic Amenity Route)		
GPS Reference	N 53 º13.577' H007 º48.472'	Elevation	+ 46m
Proximity to Application Site	550m	Photograph Date	26.05.2009
Comment on Visibility of Existing Site	Approaching the application site from the west (Cloghan), woodland and mature vegetation on the western site boundary become visible over intervening trimmed hedgerows. Several electricity pylons are evident on the skyline and landscape areas to the south-east. The application site is currently obscured from views by intervening vegetation.		

VRP 05	R357 Road, Lumcloon; (Designated Scenic Amenity Route)		
GPS Reference	N 53 º13.626' H007 º48.104'	Elevation	+50m
Proximity to Application Site	320m	Photograph Date	26.05.2009
Comment on Visibility of Existing Site	Approaching the application site from the west (Cloghan), the existing hedgerow on south of the R357 Road serves to obscure views to the south and east. This VRP is from a field gateway entrance off the road and serves to demonstrate the existing network of hedgerows in the open pastureland to the west of the application site and the extent of woodland on the western site boundary. Electricity pylons are a feature of the landscape character.		

6.3.5.3 Views: South

To the south, the landscape within the nearest kilometre is predominantly pastureland with large to medium sized fields and roads /lanes bound by thickset hedgerows. The small lane that bounds the west of the application site accesses the R437 approximately 600m to the south near Millbrook Bridge and there is a small but dispersed "hamlet" in this area. Views of the existing application site are obscured by vegetation on the application site boundary and within intervening fields.

Beyond this area, the landscape is open flat peatland largely devoid of settlement for up to 3km. The R437 is the only road in this landscape and is very straight for approximately a 3km stretch from Broughal Cross Roads on an alignment almost directly towards the application site.

VRP 02	**R437 Road, Lumcloon; (Designated Scenic Amenity Route)**		
GPS Reference	N53 º13.286' H007 º48.345'	Elevation	+ 47m
Proximity to Application Site	750m	Photograph Date	26.05.2009
Comment on Visibility of Existing Site	To the south-east of the application site are large open pasture fields bound by thickset hedgerows that serve to obscure views from passing cars on the road (between Kilcormac and Cloghan). At locations where there are gaps (e.g. gates), views are afforded. VRP2 is taken over a section of this hedgerow to give a representative viewpoint from this area. While the area is slightly higher than the application site, views are obscured by intervening field hedgerows and the boundary vegetation on the lane to the west of the site itself.		

6.3.5.4 Views: East

The landscape to the east is very sparsely settled with the majority of residential properties being located in and around the R357 road junction at Lea Beg, 4km distant. The R357 road is the only access public route in the intervening landscape. From Lea Beg the marked walk of Offaly Way crosses the open countryside or runs concurrent with minor roads in a north-south trajectory. The Offaly Way connects some of the Lough Boora Parkland areas located to the east of the application site.

VRP 07	**R357 Road, near townland of Rin; (Designated Scenic Amenity Route)**		
GPS Reference	N 53 º13.767' H007 º47.067'	Elevation	+49m
Proximity to Application Site	300m	Photograph Date	14.05.2009
Comment on Visibility of Existing Site	Travelling west on the very straight R357, conifer plantations and thick hedgerows obscure the landscape to the south and west for much of the section through the Rin townland. At this viewpoint, views towards the east of the application site open up due to clearings in the woodland. Evidence of the former industrial nature of		

	the application site is visible including remnant railway, sheds and power-lines.

VRP 08	R357 Road, Gorteen Bridge in townland of Rin; (Designated Scenic Amenity Route)		
GPS Reference	N 53 º13.939' H007 º45.549'	Elevation	+51m
Proximity to Application Site	3.1km	Photograph Date	14.05.2009
Comment on Visibility of Existing Site	This section of the R375 is typical of the nature of some of the more significant roads in this area being very straight, slightly elevated above the peatland landscape and with limited or no hedgerows. Views to the west are open and expansive with intervening hedgerows or conifer woodlands located on skylines and closing off views of the application site.		

VRP 09	**The Offaly Way near Leabeg**		
GPS Reference	N 53 º14.390 H007 º44.284'	Elevation	+51m
Proximity to Application Site	3.5km	Photograph Date	14.05.2009
Comment on Visibility of Existing Site	In and around Lea Beg to the north-east of the application site are large open pasture fields situated around this section of the Offaly Way (a vehicular cul-de-sac). This section that goes on to connect to the Grand Canal Way is a narrow lane with thick hedgerows that limit visibility beyond the lane itself. Where views are afforded (e.g. gates), they are of large fields but the view is closed off by further hedgerows or conifer woodland. The application site is not visible from this area.		

6.3.6 Landscape Qualities

6.3.6.1 Landscape Value

The existing application site comprises a brownfield site with remnant hard stand areas that has become colonised by grass, weed and occasional scrub. It is a damaged landscape and the core possesses no unique landscape features or ones that would be considered rare or locally significant. It is fenced off and inaccessible with well wooded or vegetated boundaries that screen the majority of the site and screen it from the R357 road hiding it's degraded and neglected condition. The key landscape features of the application site are the woodland block to the north-west and some of the vegetation aligning the boundary with the R357 road.

In overall terms, the application site carries no landscape designations and has a *low value and quality*.

Beyond the site periphery, this is a remote and sparsely populated landscape that has been subject to a history of large scale peat extraction that has left a significant mark. Subsequent conifer plantations across the peatlands have somewhat angular forms and can be considered incongruous with what would be perceived to be the natural landscape character of this area. The essence of the Bog of Allen landscape itself is one of notable flatness and has a rarity in terms of character but many areas have been affected or damaged to such a degree that restoration is required and suggests an overall rating of *medium value and quality* landscape. In many areas there is no distinct landscape pattern and local landmarks or features are of a very limited nature but the broad landscape scale and character suggest a resilience and adaptability to change.

There are areas that have remained relatively untouched or have been restored (such as the nearby Lough Boora Parklands) and this has redressed some of the historical lands-uses and these areas have a *high value and quality*.

6.3.6.2 Landscape Sensitivity

Landscape sensitivity is based on the ability of the surrounding landscape to accommodate and absorb changes within the confines of the application site and the degree of sensitivity of peripheral area's inherent quality and character.

The Offaly County Development Plan classifies landscape sensitivity across the Bog of Allen area and the application site is located in an area classified as *'low sensitivity'*. This can partially be attributed to the previous land-use on this site but also on account of its relative remoteness and the changes this landscape has experienced in the last 100 years. The existing site is well screened from vantage points to the north and west and the majority of "visual receptors" are those travelling though the area on the R357 Road and who have transient, partial or oblique views of the application site.

The application site's current contribution to the wider landscape quality or value is very limited and it is considered that it has a good ability to accommodate and absorb change without significant detriment to peripheral area's character.

6.4 NATURE AND SCOPE OF THE PROPOSED DEVELOPMENT

6.4.1 Introduction

This section describes the elements of the proposed development that will change the existing landscape setting of the application site and the proposed measures that would be incorporated to provide mitigation against potential effects that may derive from these changes.

It is recognised that project characteristics, and hence sources of effects, will vary through time. The construction and operation phases of such a development are characterized by quite different physical elements and activities. The duration of the effect is also a material consideration, since a lesser effect may be less tolerable if it continues for a significant period.

6.4.2 Construction Period

The construction works is likely to result in the following key effects:-

- Earthworks involving removal of remnant foundations and hard-standings of former power station;
- Widening of existing site entrance off R357 Road and pruning of overgrown vegetation on road verges to facilitate sight-lines;
- Provision of secondary access onto R357 Road, east of main entrance to the application site;
- Provision of Security Hut at main site entrance;
- Provision of new internal access road (6.0m wide) and parking areas (total 16 spaces);
- Regrading works as necessary to create a level surface at 46.80m (proposed finished floor level of all buildings);
- Construction activity and equipment including vehicular movements, cranes and provision of temporary contractors compound;
- Erection of new site boundary security fencing (5.0m high chain-link) along application site boundary (to replace existing post and wire fence as necessary);
- Felling of existing woodland to north-west corner of the site;

- Construction piling maybe necessary in some areas due to the nature of the existing ground;
- Construction of Power Plant and accompanying landscape works.

6.4.3 Operational Period

The operational period of the Power Plant entails the following elements that have potential effects on the landscape character and visual amenity of the surrounding areas:-

- Power Generation Building:- a building covering an area of 8,440 m². This will be comprise a series of buildings with roof apex of 14m for those to the west and north with two blocks of taller buildings with 28m high apex to the centre and south;
- Stacks:- 4 no. 3.2m diameter x 38.0m high by pass stacks and 4 no. 3.2m diameter x 49.0m high from the combined cycle process;
- Administration Building:- 30.0m long x 12.0m wide with roof eaves of 5.0m;
- Warehouse Building:- 30.0m long x 26.0m wide with roof apex of 12.4m;
- Area designated for Above Ground Installation:- 1,182 m²;
- Switch Yard Area: - 9,261 m² containing the existing pylons. Yard will be drained conventionally and include oil and silt inceptor and gravelled edge;
- Air Cool Condenser Areas:- 38.8m x 40.0m with roof parapet of 24.50m;
- Surface water attenuation tank;
- Raw water and fire water tanks;
- Water Treatment Area;
- Gas Receiving and Gas Insulated Switchgear Area;
- Formalising access roads from R357 Road and within site either in concrete or tarmac / asphalt surfacing with concrete kerbing. This will include ensuring that sight-lines onto R357 Road are retained and facilitated;
- Landscape Works (See Section 6.4, Mitigation Measures)

6.5 LANDSCAPE MITIGATION MEASURES

6.5.1 Proposed Landscape Works

The appearance of the development is a major influence on how the site will be perceived by the public so the proposals include for peripheral landscape works to be undertaken from the outset to help to mitigate potential adverse effects.

Landscape work will involve an initial phase that will be undertaken in the planting seasons concurrent to the construction phase. This will include planting and augmenting the boundary hedgerows with native trees and scrub including ash, hawthorn and oak. These works will be predominantly to areas within the application site along the R357 Road and the small lane to the west and will be undertaken with the objective of visually obscuring the working and switch yard areas from views of passing motorists.

Planting works will be based on the proposals outlined on Figure 6.21 indicating outline landscape works for all boundary areas on the application site.

The landscape proposals can be summarises as follows:

- Planting (native species) and augmenting the existing 8-14m wide belt of trees and under-storey scrub along the majority of the R357 Road boundary. Existing vegetation will be retained and overhauled as required. Planting will consist of 'bare-root' transplants, whips, feathered and standard trees which will be able to adapt readily to existing ground conditions. Emphasis will be on native species bar where more substantial and year round screening is deemed necessary. Plants will be 750-900 mm in size and planted at 450 -500 mm centres;
- Mature trees in the existing belt along the R357 Road will be retained with the recommendations given in "BS5837:2005 Guide for trees in relation to construction" be adopted to ensure site and tree safety.
- Gapping up and replanting of hedgerow along the lane to the west of the application site with native trees and shrubs to restore the visual screening;
- The maintenance programme from the outset will ensure presentable, clean and tidy site appearance including clean yard areas, managed hedgerows and woodland areas and replacement of any damaged hard landscape features or plant material;
- The proposed planting will be established through accepted planting techniques using standard landscape specifications and British/ Irish / European Standards for stock /

species / sizes and planting methods as a framework. A landscape contractor (ALCI approved) will be appointed to undertake the initial planting works.

- The management of planted areas will initially be undertaken by an ACLI approved landscape contractor with the developer remaining as client for duration of their contract. Into the longer term the site management team will undertake the necessary maintenance of the landscaped peripheral areas.

6.5.2 Monitoring

Regular monitoring will be undertaken to determine success of planting and ensure it is behaving in the manner anticipated at design stage. If required, elements of the design will be revised to accommodate changes required by actual field experience. An *'External Areas Management Plan'* will be prepared, which will set out maintenance measures and methods to mitigate issues such as plant failure as well as identify, reduce and remedy unforeseen impacts for a period of 20 years from project commencement. This will include replacement of any failed or stressed vegetation or grass material planted as part of the scheme.

6.6 PREDICTED IMPACT ON LANDSCAPE CHARACTER AND VISUAL AMENITY

6.6.1 Introduction

The aim of the assessment for this objection is to quantify the effects of a proposed power plant and to present them without bias. This requires both objective analysis and subjective professional judgement. Accordingly, the terminology used in this section is based on threshold criteria examples in Appendix 9 of the Guidelines for Landscape and Visual Impact Assessment (2nd Edition) by The Landscape Institute and The Institute of Environmental Management and Assessment 2002.

While any assessment must be measured against that of the situation that pertains at present, it is worth noting that the highest elements on the previous power station were the two concrete towers (see Figure 6.4) that stood at 87m, and were 38 meters higher than the chimney stacks that form part of this proposal. Furthermore the massing of the former power plant approximates to nearly four times that of this proposal and had a much larger footprint.

The site is currently in a 'damaged' state set amongst a peripheral rural and remote landscape with minimal topographical variation. The site has had no land use since the demolition of the previous power station in 2002. The key to this assessment is to determine the significance of the proposed change, if any, from the sites current use to that of a new gas-fired Power Station on the application site and the surrounding landscape.

6.6.2 Landscape and Visual Effects during the Construction Phase

There will be temporary to short-term adverse effects during the construction period. Taller elements involved such as cranes are likely to have localised adverse visual impacts during construction of the Plant.

The most significant adverse effect will derive from the removal of the existing conifer and mixed woodland to north-west corner of the site to facilitate the Above-Ground Installation area. The boundary hedgerow will be retained but views will be afforded into the application site that is currently screened by this woodland block.

The extent of earthworks required is not visually significant given the existing flat nature of the site and the vast majority of the earthworks area is visually obscured by the thick hedgerow along the R357 Road. The objective is to ensure there is a balance between earthworks to ensure off-site disposal of earth is minimised.

6.6.3 Effects on Landscape Character

Landscape Character Effects	
Landscape Character Area	Anticipated Landscape Effects
Application Site	The application site will experience a substantial effect during the initial construction period due to the extent of earthmoving and related activity likely to include cranes, large machinery and contractor's compounds that will have a detrimental effect on the local application site area. While this is considered adverse, the existing site is of a brownfield nature with extensive evidence of former industrial scale land-use and in overall terms, the degree of potential adversity, when measured against the existing *'damaged'* landscape setting is not significant. . By the time of the operational period, the changes to the application site will continue to be of a substantial nature with the introduction of a significant utilitarian power plant, ancillary buildings and yard areas. All traces of the existing application site will be eradicated with the most adverse effect deriving from the removal of the woodland to the NW corner. The existing site has an untidy and unkempt appearance and the hardstand areas associated with the new plant will constitute an improvement over the current landscape management or use.
Lumcloon	The R357 Road is a relatively quite road but is promoted as a scenic route and the mass of the power plant will be intermittently visible for a 2.5km stretch of the road. The character of the "road" area and local landscape is affected detrimentally by a series of elements including pylons, transmission towers and a history of industrial scale activity in this area. Consequently, the area has a somewhat bedraggled appearance. The existing site does detract from the landscape character where glimpse views are afforded of unsightly storage / yard areas and associated abandoned sheds. Views are partial or filtered by the existing boundary hedgerows but the removal of part of the woodland to the north-west corner will serve to open up views and demonstrate (at project commencement) the degraded nature of the industrial site. The new power plant will be very evident and its introduction will constitute a moderate adverse effect on the landscape

	character of this part of Lumcloon over the situation that pertains at present. The building is such a scale that its upper parts and chimney stacks will be visible over the boundary hedgerows and across the townland of Lumcloon. While the proposal is a significant introduction, this is an area that has had a history of change and power generation and it is considered well capable of absorbing such a change without significant detriment to its wider character. As the proposal settles into the landscape and the landscape proposals mature, the effects will reduce appreciably but it will continue to constitute a slight adverse effect into the medium and longer term.
The Bog of Allen Landscape	The Bog of Allen comprises a vast area across the midlands notorious for its flatness, openness and scale of its peatlands. The application site comprises a negligible portion of its total of 958 square kilometres and is deemed to be a landscape of low sensitivity in the development plan classification. Despite the flatness of the surrounding landscape, views of the site are largely closed off from public vantage points (chiefly roads) by intervening vegetation and the conifer forestry plantations. Bar those travelling through the area, there are very few people who will be affected by any change on the application site in the Bog of Allen site. The effects of the proposal on the character of the Bog of Allen will be largely negligible as its visual envelope is limited to relatively small area around the plant. Where open or glimpse views are afforded of the chimney stacks, a change in associated land use will be discernible but would only constitute a minor adverse effect in the worst case on landscape character.
Lough Boora Parklands	The Lough Boora parklands comprise a series of parklands that surround the application site with the closest being located 3km to the east. The only parts of the proposal that will be visible will be the upper parts of four stacks that would protrude above the treed skyline. Where panoramic views are afforded in the parklands they are of a very panoramic and broad nature and the stacks would form a very small part of the view. The effects on the landscape character of the parklands will be negligible on account of distance from the proposal.

6.6.4 Effects on Visual Amenity

Visual Reference Points are identified on Figure 6.8 and cross referenced to Figures 6.10 to 6.20.

Any potential atmospheric emissions from the eight chimney stacks will not be visible as plume will be of a transparent nature.

6.6.4.1 Zone of Theoretical Visibility (ZTV)

The physical limits of the proposed Power Plants visual environment – defined as its Zone of Theoretical Visibility (ZTV) – are established using a combination of Digital Terrain Modelling (DTM) software and Computer Aided Design (CAD) software. This involves the following;

- Construction of a three-dimensional digital terrain model (DTM) of the study area compiled using O.S. digital height data at 10m centres based on a 50 m grid up to 10km from the application site;
- Construction of a three-dimensional digital model of the proposed development (including any chimneys or flues) which is inserted into the DTM using based on topographical survey data;
- A Visibility Map is then created combining the digital terrain model and the digital model to determine the area of land within which there is a view of any part of the proposed development. This does not indicate accurately the significance of the impact in the view, but merely provides a statement of the fact of inter-visibility.

The ZTV is a theoretical computer-aided procedure and since its provenance lies purely with contour data, the screening effect of above ground site features such as forestry plantations, built structures, roadside hedges and even small hills (less than 10m high) are not allowed for. See Figure 6.9.

The ZTV exercise demonstrates that the proposed chimney stacks (49m high) will have potential visual effects on significant parts of the local area. It indicates that Ferbane and Cloghan will not be visually affected by the proposals and that significant areas to the north-west are obscured irrespective of vegetation cover. The key reason for this seemingly widespread visual envelope is the nature of the very flat landscape in this part of Offaly which has minimal topographical variation bar occasional ditches or isolated ridges. Given the findings of this procedure, the assessment took into consideration all these areas and summarise these in the following tables. The key finding was that the vast majority of these areas would not have any views of the proposal on account of the extent of vegetation that obscures longer views either as part of roadside hedgerows or as a collective of a series of field hedgerows or woodlands. Glimpse and partial views of the upper parts of the chimney stacks may be afforded at distant locations but they will be very small elements in any view and would have a negligible effect on the visual amenity. The main block of the power station will have a visual envelope that is largely limited to within 1km of the site.

6.6.4.2 Views: North

While there will be open views of the site from areas to the north, these areas are inaccessible to the public and there is no roads, footpaths or residential properties in this area. Given the exceptionally limited or potential number of visual receptors in this area the effects on visual amenity to the north beyond the R357 Road are considered negligible.

VPR Ref. 3	**R437 Road, (Railway Crossing) Nr Falsk.**
Visual Amenity Effects	For motorists travelling south on the R437, views are largely obscured by existing hedgerows aligning the road verges. Views open up at this area due to the railway crossing but are closed off again due to intervening woodland to the south-east between this location and the application site. The power plant will be obscured but there will be glimpse and partial views of the 4 no. chimney stacks over the top of the woodland that currently forms the skyline. While this will be a notable element, it would not detract from quality of the existing view.
Summary	Negligible

VPR Ref. 4	**R357 Road, Lumcloon; (Designated Scenic Amenity Route).**
Visual Amenity Effects	The viewpoint is slightly off the R357 Road and is selected to give an example of a typical view from the very open peatland areas to the north of the application site. There is an element of intervening screening by both conifer forestry and the trees / hedgerows aligning the distant R357 Road. The combination of distance and this vegetation ensure that the main mass of the power plant will be obscured from view though the 4 no. chimneys will protrude into the skyline. Given the open and panoramic nature of the view, the introduction of these elements will not detract from the quality of this existing view.
Summary	Negligible

VPR Ref. 6	R357 Road Junction adjacent to NW corner of Site; (Designated Scenic Amenity Route)
Visual Amenity Effects	Travelling east on the existing R357, there is no visual evidence to passing motorists of the damaged nature of the existing application site or its former industrial scale land-use due to the extent of vegetation alongside the road and the small lane to the south (that abuts the west of the site). The removal of this woodland block will have a moderate adverse effect on the visual amenity of this area as it will open up views of the proposed power plant. As such the area will become visually dominated by the power plant. The proposals include for retention of large mature trees (within 10m strip from boundary) along the boundary and planting and augmenting the roadside hedgerows in this area once construction is completed. As this matures, the effects will appreciably reduce into the longer term.
Summary	Moderate Adverse

6.6.4.3 Views: West

The main visual receptors to the west will be those who are travelling on the R357 Road in an easterly direction. The majority of the area comprises open farmland bound by hedgerows that serve to dissolute and filter views over distance.

VPR Ref. 1	R357 Road, Lumcloon; (Designated Scenic Amenity Route)
Visual Amenity Effects	Travelling east on the R357 Road, the current view is partially obscured by intervening roadside and field hedgerows which contain some significant trees. Views to the north are closed off by the roadside hedgerow. The proposal will entail removal of vegetation on the site boundary towards this vantage point opening up views of the proposed power plant and its chimney stacks. The existing view is relatively panoramic and the site represents only a small portion of the view. The boundary planting post construction will assist in blending in the lower parts of the power plant into the view and in the longer term only the upper parts of the chimney stacks will be visible.
Summary	Minor Adverse

VPR Ref. 5	R357 Road, Lumcloon; (Designated Scenic Amenity Route)
Visual Amenity Effects	Views to the western part of the application site from this viewpoint are currently closed off. The proposal will entail removal of the woodland block to the north-west corner opening up views of the middle and upper parts of the proposed power plant. The proposal includes for replanting and augmenting this boundary but it will change the context of the view from one of a rural nature (albeit with extensive power-lines) to one dominated by industrial scale building. As the planting on the site boundary matures, the effects will lessen appreciably.
Summary	Moderate Adverse reducing to Minor Adverse in medium term.

6.6.4.4 Views: South

To the south, the landscape comprises open fields bound by significant hedgerows that filter views or cumulatively obscure views of the application site from the main residential area around Millbrook Bridge and public roads.

VPR Ref. 2	R437 Road, Lumcloon; (Designated Scenic Amenity Route)
Visual Amenity Effects	The R437 is aligned with thickset hedgerows that serve to visually obscure field areas aside bar at gateways or weak sections of the hedge where any view towards the application site would be of an oblique nature. The existing field hedgerows and those on the lane (to the west of the site) ensure that views of the majority of the power plant are obscured though the chimney stacks will protrude into the skyline. The skyline is already interrupted by a series of power-lines and this proposal will constitute additional interruption and introduce an industrial element to the character of the view.
Summary	Minor Adverse

6.6.4.5 Views: East

The landscape to the east is very sparsely settled with significant tracts of conifer forest plantation immediately to the east of the application site limiting views towards the application site. The main visual receptors to the west will be those who are travelling on the R357 Road in a westerly direction.

VPR Ref. 7	R357 Road, near townland of Rin; (Designated Scenic Amenity Route)
Visual Amenity Effects	Travelling from the west towards the application site, the views are largely obscured by woodland and roadside hedgerows. Around the railway crossing, views open up through gaps in the trees of the eastern part of the site. Existing pylons are evident to the west. The power plant will be a very evident introduction into this area and will become the dominant element in the view. Mitigation planting will serve to obscure the lower (yard) areas of the site and as this matures, the middle sections of building elevations will become obscured or filtered. The upper parts of the building and chimney stacks will remain visible into the longer term and will change the context of the view from one of a perceived rural landscape to that of an industrial nature.
Summary	Moderate Adverse

VPR Ref. 8	R357 Road, Gorteen Bridge in townland of Rin; (Designated Scenic Amenity Route)
Visual Amenity Effects	Travelling west on the R357, the landscape comprises a very broad open rural landscape with hedgerows and woodland culminating into a blurred distant skyline. For much of this section of the road, it is raised above the peatland and is not bound by hedgerows thus allowing open panoramic views. The main body of the power plant will be obscured from this view but the chimney stacks will protrude into the distant skyline. Given the open and panoramic nature of the view, the introduction of these elements will not detract from the quality of this existing view.
Summary	Negligible

VPR Ref. 9	The Offaly Way near Leabeg
Visual Amenity Effects	The extent of hedgerows bounding fields and the road verges in this area ensure that the area is visually very enclosed. Very occasional (and non-public) views may be afforded from open field areas nearby but they would only be of the upper parts of the chimney stacks and this would not detract from the quality of the existing views from this part of the study area.
Summary	Negligible

VPR Ref. 10	The Offaly Way, Behanmuck, nr. Lough Boora Parklands; Designated Area of High Amenity
Visual Amenity Effects	Existing woodland blocks to the west of this waymarked route obscure views across the flat Lough Boora landscape. Where distant views are afforded, they are panoramic but are ultimately closed off by the hedgerows and tree groups on the skyline. The proposed power plant will be obscured from this vantage point.
Summary	Negligible

VPR Ref. 11	Bird Hide, The Offaly Way, Lough Boora Parklands; Designated Area of High Amenity
Visual Amenity Effects	This is part of the Lough Boora Parklands with an open view afforded to the west across a Lakeland and marsh setting towards a distant skyline that is a culmination of wooded groups and forestry plantations. The main body of the power plant will be obscured from this view but the chimney stacks will protrude into the distant skyline. Given the open and panoramic nature of the view, the introduction of these elements will not detract from the quality of this existing view.
Summary	Negligible

VPR Ref. 12	Lough Boora Parklands; Designated Area of High Amenity
Visual Amenity Effects	Within the Lough Boora Parklands, this is an elevated vantage point situated on a former industrial railway line that offers expansive panoramic views to the west over the peatlands and woodland areas that are on the skyline. The main body of the power plant will be obscured from this view but the chimney stacks will protrude into the distant skyline. Given the open and panoramic nature of the view, the introduction of these elements will not detract from the quality of this existing view.
Summary	Negligible

VPR Ref. 13	**Top of Stone Pyramid, Lough Boora Parklands; Designated Area of High Amenity**
Visual Amenity Effects	This viewpoint is representative of the highest accessible point in the Lough Boora Parkland albeit it does involve an element of climbing. From the summit of the sculpture, it affords the most open vantage point possible from this part of the park. A very panoramic view of the flat landscape to the west is afforded which has a wooded characteristic made up of smaller trees and scrub that merge visually into the conifer plantations beyond. The main body of the power plant will be obscured from this view but the chimney stacks will protrude into the distant skyline. Given the open and panoramic nature of the view, the introduction of these elements will not detract from the quality of this existing view.
Summary	Negligible

6.6.5 Do Nothing Effects

It is likely that the site will continue to be a brownfield site for the foreseeable future. There is not likely to be a proposal to restore this land to agricultural use or alternative land use given its remoteness and the cost of a restorative scheme.

6.7 SUMMARY OF LVIA ASSESSMENT

The existing application site comprises a brownfield site that presents a damaged landscape with a core that possesses no unique landscape features. It is fenced off and inaccessible with well wooded or vegetated boundaries that screen the majority of the site and screen it from neighbouring areas. The key landscape features of the application site are the woodland block to the north-west and some of the vegetation aligning the boundary with the R357 road. It carries no landscape designations and has a *low value and quality*.

Beyond the site periphery, is a remote and sparsely populated landscape that has been subject to a history of large scale industrial for peat extraction. Subsequent conifer plantations across the peatlands have somewhat angular forms and can be considered incongruous with what would be perceived to be the natural landscape character of this area. The essence of the Bog of Allen landscape itself is one of notable flatness and it has a rarity in terms of character but many areas have been affected or damaged to such a degree that restoration is required and suggests an overall rating of *medium value and quality* landscape.

The Offaly County Development Plan classifies landscape sensitivity across the Bog of Allen area and the application site is located in an area classified as *'low sensitivity'.*

There are areas that have remained untouched or have been restored (such as the nearby Lough Boora Parklands) and this has redressed some of the historical lands-use disturbance and these areas have a *high value and quality.*

The proposal involves construction and operation of a gas fired power plant. This will be comprise a main core building with roof apex of 14m and two blocks of taller buildings with 28m high apex. Four 38m and four 49m chimney stacks are included in the proposal. Ancillary development includes administration, buildings tanks, switch yards, warehouses and formalising accesses onto the R357 road.

There will be temporary to short-term adverse effects during the construction period. Taller elements involved such as cranes are likely to have localised adverse visual impacts during construction of the Plant. The most significant adverse effect will derive from the removal of the existing conifer and mixed woodland to north-west corner of the site to facilitate the Above-Ground Installation area. The boundary hedgerow will be retained but views will be afforded into the application site that is currently screened by this woodland block.

The new power plant will be very evident and its introduction will constitute a moderate adverse effect on the landscape character of this part of Lumcloon over the situation that pertains at present. The building is such a scale that its upper parts and chimney stacks will be visible over the boundary hedgerows and across the townland of Lumcloon. The effects of the proposal on the character of the Bog of Allen (including the Lough Borra Parklands) will be largely negligible. The main body of the power plant will be obscured from these areas but the chimney stacks will protrude into the distant skyline. Where open/ glimpse views are afforded, the introduction of these elements will suggest a change in associated land use but will not detract from the quality of this existing view or landscape character. The main visual receptors will be those who are travelling on the R357 Road and who will be passing the application site and have oblique views.

While the proposal is a significant introduction, this is an area that has had a history of major landscape and land-use change and it is considered well capable of absorbing this proposal without significant detriment to its wider character and visual amenity.

7.0 SOILS AND GEOLOGY

7.1 INTRODUCTION

This chapter of the EIS consists of an assessment of the potential impacts of the proposed development on soils and geology. Provided in this chapter is a description of the existing soils and geology environment and a statement of the likely significant soils and geology impacts associated with both the construction and operational phases of the proposed development. Measures to mitigate the likely significant impacts of the proposed development are proposed, and residual impacts described.

7.2 METHODOLOGY

7.2.1 Baseline

The chapter has been prepared in accordance with the following guidelines:

- Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Statements (2002);
- Environmental Protection Agency (EPA) Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003);
- Institute of Geologists of Ireland (IGI) Geology in Environmental Impact Statements – A Guide (2002).

Consultees contacted for the purposes of the soils and geology study were:

- Geological Survey of Ireland (GSI);
- Department of Environment, Heritage & Local Government (DoEHLG);
- Environmental Protection Agency (EPA);
- Offaly County Council.

Consultation was also undertaken with other specialists in order to assess the impact of the interaction with other environmental factors. This included consultation with the hydrogeology and hydrology specialist in relation to the risk to water quality, and the human beings specialist in relation to the risk to human health from contaminated land.

7.2.1.1 Study Area and Baseline Data Collection

A desk study was undertaken of the proposed development site and its surroundings, within a radius of approximately 5km. Information on the regional geology for the desk study was sourced primarily from the GSI bedrock and subsoil datasets.

The brownfield nature of the site required that a preliminary contamination assessment was undertaken. This comprised a site walkover survey and review of previous contamination assessment reports.

The following is a list of the sources of information used for the soil and geology assessment.

- GSI bedrock (Geology of Galway – Offaly Sheet No. 15) and Teagasc subsoil mapping;
- Environmental Protection Agency (EPA) – National Groundwater Monitoring Programme;
- Offaly County Council – Water Services Section;
- ESB Exit Audit Reports: Phase 1 (July 2003) and Phase 2 (May 2005);
- URS Ireland Site Assessment (June 2005) and Exit Audit Summary Reports (June 2005 & April 2008) Letter Report (April 2008);
- Feedback from consultations with statutory consultees, interested organisations and affected third parties.

This information was used to describe and evaluate the soils and geology environment at the proposed development site and in its vicinity and to identify and categorise the likely significant impacts of the proposed development on this environment.

7.2.2 Impact Assessment

The potential impacts of the proposed development on soils and geology were assessed as per the criteria for impact assessment provided in "*Guidelines on the Information to be Contained in Environmental Impact Statements*" (EPA 2002). The impacts are described by identifying three key aspects as follows:

- Beneficial, adverse or neutral – The impacts were assessed as being beneficial, adverse or neutral.
- Impact Magnitude – The magnitude of each impact was considered as being Negligible, Slight, Moderate or Significant in the case of negative impacts. The magnitude was considered as being minor, moderate or major in the case of

beneficial impacts. The criteria for determining the magnitude of the impacts is summarised in Table 7.1 below.

Table 7.1 Criteria for Assessing Impact Magnitude

Impact Magnitude	Criteria
Significant Adverse	Results in loss of attribute
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute
Slight Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity
Minor Beneficial	Results in minor improvement of attribute quality
Moderate Beneficial	Results in moderate improvement of attribute quality
Major Beneficial	Results in major improvement of attribute quality

- Duration – The duration of each impact was considered to be either temporary, short-term, medium term, long-term or a permanent impact. Temporary impacts are considered to be those which are construction related and last less than one year. Short term impacts were seen as impacts lasting one to seven years. Medium-term impacts are impacts lasting seven to fifteen years. Long-term impacts are impacts lasting fifteen to sixty years and permanent impacts are impacts lasting over sixty years.

Where a significant impact is anticipated, mitigation measures are proposed to minimise the effect of the impact.

7.3 RECEIVING ENVIRONMENT

The following section provides an overview of the regional geological environment. Further detail is provided for the proposed development site. Bedrock geology, subsoils and geological features of importance such as karst features and geological heritage areas are documented.

7.3.1 Bedrock & Structural Geology

7.3.1.1 Regional Bedrock Geology

The area is dominated by northeast-southwest trending anticlines with a core of Old Red Sandstone facies succeeded by Courceyan limestone and shale, with synclines comprising younger sequences of Waulsortian and Visean basinal limestones. The Ferbane inlier, a large anticlinal fold orientated NE-SW is located to the north of the proposed development site with Old Red Sandstone at its core while the Slieve Bloom inlier lies to the south.

The Ferbane fault, a major northeast–southwest trending fault defines the northern margin of the Ferbane inlier. During the Variscan Orogeny horizontal northwest compression caused reverse movement of this fault and produced dextral transpression. The Knockshigowna Fault, also major northeast–southwest trending fault lies north of the Slieve Bloom inlier.

A map of regional bedrock and structural geology is shown in Figure 7.1.

7.3.1.2 Local Bedrock Geology

The proposed development site is underlain by Waulsortian Limestones (WA). These are described as pale grey, sparry, fossilferous (bryozoan), poly-mud micritic limestones, often massive knoll forms, with crinoidal or pale cherty shaly interbeds and frequently dolomitised.

Information from borehole logs compiled during site investigations describe bedrock at the proposed development site as grey to brown thickly bedded, fine to medium grained, fractured limestone.

7.3.2 Karstification

The Waulsortian limestone is prone to karstification due to the calcium carbonate content of the limestone. Karstification results from dissolution of limestone by percolating rainwater that finds its ways down through cracks, joints or discontinuities in the bedrock.

There are no recorded karst features at the site of the proposed development and the immediate surroundings. The nearest mapped karst features are two springs at Kilcormac, approximately 6.2km and 6.9km to the south respectively. A further spring is located 7.2km to the southwest of the proposed development site and south of Cloghan village. No karst features were observed at the proposed development site or within a 1km radius of it during site visits in 2009.

7.3.3 Subsoils

7.3.3.1 Regional Subsoils

Regionally the area is dominated by cutover peat bogs with areas of till derived chiefly from limestone and areas of alluvium associated with the Silver River which lies to the east of the site. Glaciofluvial sands and gravels are found approximately 4.5km north of the site at Ferbane and 6.0km south of the site at Fivealley. Teagasc subsoil maps indicate the proposed development site is underlain by made ground.

A map of the subsoil geology for the area (as mapped by Teagasc) is shown in Figure 7.2.

7.3.3.2 Local Subsoils

Site specific information for subsoils was obtained from site investigations undertaken in 1997 and 2004 at the site of the former ESB plant works. The proposed development area comprises only 11 acres of the former ESB site which comprised 48 acres in total. Therefore, the following information refers not only to the proposed development site but also to adjacent lands to the south and southeast.

The logs for borehole drilled as part of the 1997 site investigations indicate that subsoils at the site comprise glacial deposits ranging in thickness from 4.0m to 7.4m, with an average thickness of 5.3m. The glacial deposits consist of moderately permeable till overlying moderately to highly permeable gravels. A thin layer of black sandy clay perhaps representing peat ash was encountered in boreholes to the central and east areas of the proposed development site. Limestone bedrock was encountered beneath the glacial and comprised grey and brown fractured thickly bedded fine grained limestone with occasional calcite filled vugs.

Made ground was encountered in all trial pits excavated as part of the 2004 site investigation and comprised hardcore, peat ash and clay or gravel fill.

7.3.4 Contamination Assessment

Environmental exit audits were undertaken by ESB and URS (on behalf of ESB) between 2003 and 2008 for the former ESB owned peat powered station at Lumcloom, Ferbane, Co. Offaly. The report assessments were undertaken on all lands within the boundary of the former ESB owned power site. Lumcloom Energy Ltd. only acquired part (i.e. 11 acres) of the former ESB owned power site and proposes to develop the gas fired powered station on these lands.

A report on Phase 1 of the exit audit process reported that asbestos containing materials (ACM) had been detected in the station dump area (ash field) which is located 450m south east of the proposed development site. Remediation work was undertaken and the ACM removed. The Phase 1 report also indicated that the soils at the site had potentially been impacted by oil or chemical spills in the vicinity of the station site.

Phase 2 assessment works included a site investigation (SI) which was undertaken in 2004 across the full former site. The SI found frequent low-level contamination by a number of metals which was attributed to the presence of peat ash disposed in the ash field south east of the proposed development site. Localised low-level contamination by a number of other metals and phenol was also reported in the shallow soils. This was attributed to materials deposited during station activities or site demolition.

The Phase 2 investigations within the proposed development site found frequent low level contamination by arsenic and vanadium and less frequent low level contamination by cadmium, molybdenum and nickel. The source of the metals is thought to be a result of the presence or influence of peat ash. Localised low level lead, copper, zinc and phenol contamination was also reported which might relate to demolition waste or past station activities. Low level lead contamination was found in the vicinity of the former main station buildings in the north and central areas of the proposed development site. Low level copper and zinc contamination was found in the north and central areas of the site (former main station buildings) and in the southwest of the site (former transformer bays). Low level phenol contamination was found in the north and central areas of the site (former main station buildings) and in a few samples elsewhere on the site.

Low-level hydrocarbon contamination was found in near-surface soils in the location of the former transformer bays. These areas are located in the southwest of the proposed development site. An area of more elevated hydrocarbon contamination was identified in the electrical compound which borders the south west boundary of the proposed site. It was concluded that the hydrocarbon contamination encountered was unlikely to have an impact upon the local environment.

Asbestos-containing material (ACM) was not observed or detected in any of the trial pits or boreholes within the proposed development site or the surrounding areas investigated as part of the Phase 2 works.

A site inspection conducted by URS in February 2008 noted that no suspected ACM was observed during this inspection. Soil samples were taken from two mounded areas within the proposed development site. No asbestos fibres were detected in the samples.

To summarise, contamination of soils at the site comprises low-level metal and phenol contamination. This was assessed to have a low environmental and human health impact. There are limited areas of low level and elevated levels of hydrocarbon contamination in the south west of the proposed development site (former ESB electrical compound). This was assessed to have a low environmental impact. The proposed development site was also determined to be *'asbestos safe'*.

The proposed industrial development of the site will not be affected or restricted by the low-level soil contamination at the site. It was determined as part of the contamination assessment that no remedial action will be required for the proposed development.

7.3.5 Sites of Geological Interest

There are no geological heritage sites at the site of the proposed development. The nearest geological heritage site, Lough Boora, lies approximately 2.8km to the southeast of the proposed development site. This is a site of an early post-glacial lakeshore which has been exposed by drainage and excavation associated with turf cutting. It is listed under the IGH7 Quaternary Theme and IGH14 Fluvial Lacustrine Theme.

7.4 IMPACT ASSESSMENT

The impacts of the proposed development on the soils and geology environment were assessed as per the methodology described in Section 7.1.3 above. Potential impacts that the proposed development can have on the existing soil and geology environment are mainly the following: disturbance of contaminated ground during construction and indirect impacts on surface water and groundwater quality arising from this. These potential impacts are discussed below.

7.4.1 Construction Phase

7.4.1.1 Contaminated Ground

The principal potential impact on soils and geology arises from the disturbance of contaminated soil which will be required during the construction phase. Generally soil contamination across the site was assessed as being low-level and no impact on the environment is anticipated. The extent of the contamination comprised low level metal and phenol contamination and low level hydrocarbon contamination in limited areas. It is not anticipated that these areas will have any impact on the proposed development.

The 2008 Summary Environmental Exit Audit Report (URS 2008) states no evidence of chemical contamination in soil that would limit redevelopment of the subject area for commercial or industrial use. Based on the limited area of deposits and low level nature of the contamination, it is anticipated that there will be a negligible impact to soil quality from disturbance of soils during construction. No soil remediation will be required prior to construction.

Significant excavation is not required for the site development works. However, should soil need to be removed off site for localised works then this will be carried out in accordance with Irish waste legislative requirements.

7.4.1.2 Soil Erosion

The nature of the development will require the disturbance and exposure of soils during construction. This has the potential to cause soil erosion and sediment loss while soils are exposed.

7.4.1.3 Fuel Storage

There is a potential impact on soils and geology from accidental spillages or leaks from vehicles on site during the construction phase.

7.4.1.4 Sites of Geological Heritage

Given the distance of Lough Boora from the proposed development site (2.8km), it is anticipated that there will be no impact on this site.

7.4.1.5 Geotechnical Issues

There are no deep excavations planned as part of the proposed development. There are no areas of soft ground on site and issues with regard to slope stability have been identified at the site.

7.4.2 Operational Phase

The potential impacts of the proposed development during the operational phase were assessed as per the methodology describe in Section 7.1.3 above. A summary of the assessment is provided in Table 7.2 below.

7.4.2.1 Contaminated Ground

It is not anticipated that there will be any impact from the proposed development on the contaminated ground during the operational phase.

7.4.2.2 Fuel & Chemical Storage

A number of chemicals will be stored on the site during regular operation including chemicals for water treatment and boiler dosing. An assortment of lubricants, oils and greases will also required storage on site.

In addition diesel will be stored on site to be used as a back up fuel in the event of interruption to the natural gas supply in order comply with the Commission for Energy Regulation (CER) Regulations. Five days running capacity (approximately 5,200m^3) of diesel will be stored on the site.

As a result of the above materials the site will be classified as lower tier COMAH in accordance with European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2006 (S.I. No. 74 of 2006).

There is potential for contamination of soils in the event of an accidental spillage or leak of any of the above materials.

7.4.2.3 Sites of Geological Heritage

Given the distance of Lough Boora from the proposed development site (2.8km), it is anticipated that there will be no impact on this site.

7.5 MITIGATION MEASURES

7.5.1 Construction Phase

7.5.1.1 Fuel & Chemical Storage

An environmental operating plan will be implemented during construction which will minimise the potential for accidental spills/ contamination. This plan will include detailed measures to minimise environmental impact including the following:

Chemicals and other construction materials will be safely stored to ensure the risk of oil or chemical contamination of soil is minimised.

Appropriate measures will be put in place to minimise the risk of soil contamination from re-fuelling of vehicles, e.g., re-fuelling to be undertaken in designated areas with drained hard standing, and spill kits in place.

Good housekeeping (daily site clean-ups, use of disposal bins, etc.) on the project site, and the proper use, storage and disposal of many substances used on construction sites, such as lubricants, fuels and oils and their containers can prevent soil contamination.

A contingency plan for pollution emergencies will also be developed by the appointed contractor prior to work and regularly updated, which would identify the actions to be taken in the event of a pollution incident. The CIRIA document (2001) recommends that a contingency plan for pollution emergencies should address the following:

- Containment measures;
- Emergency discharge routes;
- List of appropriate equipment and clean-up materials;
- Maintenance schedule for equipment;
- Details of trained staff, location, and provision for 24-hour cover;
- Details of staff responsibilities;
- Notification procedures to inform the relevant environmental protection authority;
- Audit and review schedule;
- Telephone numbers of statutory water undertakers and local water company;
- List of specialist pollution clean-up companies and their telephone numbers.

7.5.1.2 Soil Erosion

The disturbance/exposure of soils from the site will be carried out during suitable weather conditions in order to minimise the production of sediment and to reduce nutrient loss. Exposed soils will be seeded as soon as possible to reduce the likelihood of erosion. Earth berms will be erected around the site to prevent sediment loss from the site during the construction process.

7.5.2 Operational Phase

7.5.2.1 Fuel & Chemical Storage

A back up supply of diesel (5,200m^3) is required at the site in the event of an interruption of the gas supply. All appropriate measures will be taken to minimise the risk of accidental spillages or leaks. The fuel will be stored in a cylindrical steel tank within a 110% capacity bund to comply with bunding requirements. The bund will be constructed in accordance with CIRIA Report 163 "*Construction of Bunds for Oil Storage Tanks*" and BS8007:1987 "*Code of Practice for Design of Concrete Structures for Retaining Aqueous Liquids*". The diesel oil will be limited to 0.1% sulphur as per the requirements of EU Directive 1999/32/EC (relating to a reduction in the sulphur content of certain liquid fuels)

The site will be classified as lower tier COMAH in accordance with European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2006 (S.I. No. 74 of 2006). In accordance with legislative requirements, a major accident hazard (MAH) report was prepared for the proposed development. This report details risk and consequence assessments for the site in accordance with the Health and Safety Authority (HSA) guidance document entitled 'Setting the Specified Area – The Approach of the HSA'.

7.6 RESIDUAL IMPACTS

There will be a temporary negligible adverse impact on soils and geology from the proposed development due to the low level of soil contamination.

There will be temporary negligible potential adverse impact from accidental spillages or leaks from chemicals or fuels stored on the site during the construction or operational phases following appropriate mitigation measures.

There will be a temporary negligible adverse impact relating to soil erosion or sediment loss during the construction phase following mitigation measures.

There will be no impact relating to geotechnical issues from the proposed development.

There will be no impact on the Lough Boora from the proposed development during either the construction or operational phases.

Table 7.2 Summary of Residual Impacts on Soil & Geology

Magnitude of Impact	Criteria	Residual Impact
Significant Adverse	Results in loss of attribute	None
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	None
Slight Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	None
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Disturbance of low level contaminated soils during construction Contamination of soils from accidental spills/leaks of fuel/chemicals during construction and operation Soil erosion & sediment loss during construction
Minor Beneficial	Results in minor improvement of attribute quality	None
Moderate Beneficial	Results in moderate improvement of attribute quality	None
Major Beneficial	Results in major improvement of attribute quality	None

7.7 REFERENCES

- Environmental Protection Agency, 2003. *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements*.
- Environmental Protection Agency, 2002. *Guidelines on the Information to be contained in Environmental Impact Statements.*
- Environmental Protection Agency Ireland (EPA) website - www.epa.ie
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- ESB International, July 2003*. Ferbane Generating Station – Environmental Exit Audit Phase 1 Report*.
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- Institute of Geologists of Ireland (IGI), 2002. *Geology in Environmental Impact Statements: A Guide.*
- URS Ireland, June 2005. *Environmental Exit Audit Summary Report – Ferbane Generating Station, Co. Offaly.*
- URS Ireland, June 2005. *Environmental Site Assessment of Station Dump Area – Former ESB Generating Station, Ferbane, Co. Offaly.*
- URS Ireland, April 2008. *Letter Report – ESB Ferbane Site Inspection*.
- URS Ireland, April 2008. *Summary Environmental Exit Audit Report – Northern Portion of Former ESB Generating Station, Ferbane, Co. Offaly.*
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8.0 GROUNDWATER

8.1 INTRODUCTION

This chapter of the EIS consists of an assessment of the potential impacts of the proposed development on the hydrogeological environment. Provided in this chapter is a description of the existing soils and geology environment and a statement of the likely significant hydrogeological impacts associated with both the construction and operational phases of the proposed development. Measures to mitigate the likely significant impacts of the proposed development are proposed, and residual impacts described.

8.2 METHODOLOGY

8.2.1 Baseline

The chapter has been prepared in accordance with the following guidelines:

- Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Statements (2002);
- Environmental Protection Agency (EPA) Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003);
- Institute of Geologists of Ireland (IGI) Geology in Environmental Impact Statements – A Guide (2002).

Consultation was carried out with the relevant bodies as detailed below.

- Geological Survey of Ireland (GSI);
- Department of Environment, Heritage & Local Government (DoEHLG);
- Environmental Protection Agency (EPA);
- Offaly County Council.

Consultation was also undertaken with other specialists in order to assess the impact of the interaction with other environmental factors. This included consultation with the soil and geology specialist in relation to contaminated ground and the potential risk to groundwater quality, and the hydrology specialist in relation to the groundwater and surface water interactions.

8.2.1.1 Study Area and Baseline Data Collection

A desk study was undertaken for the proposed development site and its surroundings (within a radius of approximately 5km). Information for the desk study was sourced primarily from GSI geological and hydrogeological datasets. Information on groundwater quality in the area was sourced from previous site investigation reports for the former ESB peat plant.

A site walkover was undertaken by WYG personnel in May 2008 and a well survey was undertaken within a 1km radius of the site to identify all third party wells within this vicinity. A pumping test was undertaken on the proposed abstraction well on the site of the proposed development in June 2009. A sample was also taken from the well for hydrochemical analysis.

The following is a list of the sources of information used for the hydrogeology assessment.

- GSI geology and hydrogeology datasets;
- Environmental Protection Agency (EPA) – National Groundwater Monitoring Programme;
- Offaly County Council – Water Services Section;
- ESB Exit Audit Reports: Phase 1 (July 2003) and Phase 2 (May 2005);
- URS Ireland Site Assessment (June 2005) and Exit Audit Summary Reports (June 2005 & April 2008) Letter Report (April 2008);
- Feedback from consultations with statutory consultees, interested organisations and affected third parties.

This information was used to describe and evaluate the hydrogeological environment at the proposed development site and in its vicinity and to identify and categorise the likely significant impacts of the proposed development on this environment.

8.2.2 Impact Assessment

The potential impacts of the proposed development on soils and geology were assessed as per the criteria for impact assessment provided in "*Guidelines on the Information to be Contained in Environmental Impact Statements*" (EPA 2002). The impacts are described by identifying three key aspects as follows:

- Beneficial, adverse or neutral – The impacts were assessed as being beneficial, adverse or neutral.

- Impact Magnitude – The magnitude of each impact was considered as being Negligible, Slight, Moderate or Significant in the case of negative impacts. The magnitude was considered as being minor, moderate or major in the case of beneficial impacts. The criteria for determining the magnitude of the impacts is summarised in Table 8.1 below.

Table 8.1 Criteria for Assessing Impact Magnitude

Impact Magnitude	Criteria
Significant Adverse	Results in loss of attribute
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute
Slight Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity
Minor Beneficial	Results in minor improvement of attribute quality
Moderate Beneficial	Results in moderate improvement of attribute quality
Major Beneficial	Results in major improvement of attribute quality

- Duration – The duration of each impact was considered to be either temporary, short-term, medium term, long-term or a permanent impact. Temporary impacts are considered to be those which are construction related and last less than one year. Short term impacts were seen as impacts lasting one to seven years. Medium-term impacts are impacts lasting seven to fifteen years. Long-term impacts are impacts lasting fifteen to sixty years and permanent impacts are impacts lasting over sixty years.

Where a significant impact is anticipated, mitigation measures are proposed to minimise the effect of the impact.

8.3 RECEIVING ENVIRONMENT

The following sections provide an overview of the regional hydrogeological environment. Further detail is provided for the proposed development site. Bedrock geology, subsoils and geological features of importance such as karst features and geological heritage areas are documented.

8.3.1 Aquifer Characterisation

The bedrock beneath the site comprises Dinantian Pure Unbedded Limestones (DPUL) of the Waulsortian Limestone Formation (WA). This formation comprises pale grey, sparry, fossilferous, (bryozoan) poly-mud micritic limestones, often massive knoll forms, with crinoidal or pale cherty shaly interbeds and frequently dolomitised. The limestone in this area is classified by the GSI as Locally Important (LI) aquifer which is described as bedrock which is moderately productive in local zones only. A map of aquifer classification for the area is shown in Figure 8.1.

A pumping test was undertaken on the proposed abstraction borehole at the site (referred to in this report as PW1). Details of the results and analysis of the pumping test are provided in the Impact Assessment Section below. Analysis of the pumping test data indicates an aquifer transmissivity of $130m^2/d$. The depth of the water bearing zone in the borehole was unknown as no borehole log was available. Therefore, an estimation of aquifer permeability was not possible.

8.3.2 WFD Groundwater Body Status

The groundwater body underlying the site is the Clara GWB which was delineated for the purposes of the EU Water Framework directive (WFD). The fundamental objective of the EU WFD aims at maintaining "high status" of waters where it exists; prevent any deterioration in the existing status of waters and achieving at least "good status" in relation to all waters by 2015. The current WFD status of the Clara GWB is Good (*Shannon IRBD 2008*).

8.3.3 Karstification

There are no karst features at the site of the proposed development. The nearest karst features are two springs at Kilcormac, approximately 6.2km and 6.9km respectively to the south. The next nearest spring is located 7.2km to the southwest of the proposed development site. No karst features were observed at the proposed development site or within a 1km radius of it during site visits in 2009.

8.3.4 Aquifer Vulnerability

The term 'vulnerability' is used to describe the ease with which groundwater may be contaminated by human activities (DELG et al., 1999). The vulnerability of groundwater depends on the time of travel of infiltrating water (and contaminants), the relative quantity of contaminants that can reach the groundwater and the contaminant attenuation capacity of the geological materials through which the water and contaminates infiltrate. These are more specifically determined at the site by the type and permeability of the subsoils, the thickness of the unsaturated zone through which the contaminant moves and the recharge type, whether point or diffuse.

The classification guidelines, as published by the GSI, are given in Table 8.2 below. It shows that the less permeable and thicker the overburden overlying an aquifer is, the lower the vulnerability of the aquifer to contamination.

Table 8.2 GSI Groundwater Vulnerability Guidelines

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) & Thickness			Unsaturated Zone	Karst Features
	High Permeability (sand/gravel)	Moderate permeability (e.g. sandy subsoil)	Low permeability (e.g. clayey subsoil, clay, peat)	(sand/gravel aquifers only)	(<30m radius)
Extreme (E)	0 – 3.0m	0 – 3.0m	0 – 3.0m	0 – 3.0m	-
High (H)	>3.0m	3.0 – 10.0m	3.0 – 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 – 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A

Notes: (1) N/A = not applicable
(2) Precise permeability values cannot be given at present
(3) Release point of contaminants is assumed to be 1-2m below ground surface.

The GSI database indices groundwater vulnerability at the proposed development site is High (H). Site specific information for depth to bedrock and subsoil type was obtained from data from site investigations undertaken at the site of the former ESB plant in 1997 and 2004. Subsoils at the site comprise glacial deposits ranging in thickness from 4.0m to 7.4m, with an average thickness of 5.3m. The glacial deposits consist of moderately permeable till overlying moderately to highly permeable gravels. A thin layer of black sandy clay, which may represent peat ash, was encountered in boreholes to the central and east areas of the proposed development site. The groundwater vulnerability at the proposed development site is revised to range from High (H) to Moderate (M), based on subsoil permeability and thickness recorded during site investigations.

A map of groundwater vulnerability for the area is shown in Figure 8.2.

8.3.5 Groundwater Flow

No field data was available to determine groundwater flow direction or gradient across the site. In the absence of site specific data it is assumed that groundwater flow direction will be coincident with topography and be to the east/northeast towards the Silver River. Assumed groundwater flow direction is shown in Figure 8.3.

8.3.6 Hydrogeological Conceptual Model

The Waulsortian Limestone formation is the principal water bearing unit and is more than several hundred metres thick in this area. The limestone bedrock is overlain in places by gravel deposits which are in turn overlain by a confining clay layer. The gravels may provide additional aquifer storage; however, they are not large enough to be considered an aquifer. Permeability in the bedrock tends to decrease rapidly with depth (GSI, 2003). Most flow occurs in the upper 15m, in the zone that comprises a weathered layer and a connected fracture zone below this. Deeper flows may occur along faults or significant fractures, or occasionally bedding-parallel dissolution planes. The limestones have little primary or intergranular porosity with permeability dependent on fracturing and fissuring.

Groundwater levels recorded from the on-site wells and third party wells in the area indicate shallow groundwater (<5.0m below ground level (bgl)). It is likely that groundwater conditions are slightly confined where significant clays overly the gravel & bedrock layers.

Due to the shallow groundwater flow in the aquifer, groundwater and surface waters are closely linked. The streams and rivers crossing the aquifer in the area are generally gaining (*GSI 2003*).

8.3.7 Groundwater Resources

There is an existing well at the site of the proposed development which was previously used for abstraction during operation of the peat plant. It is proposed to use this well for process water purposes for the proposed gas fired plant. The well is greater than 50m deep. However, no borehole log indicting lithology or borehole construction was available.

A survey of all third party wells within 1km radius of the proposed development site was undertaken by WYG on 8th and 9th June 2009. Information on wells such as depth, diameter usage was obtained where available from the landowner. A summary of this information is provided in Table 8.3 below and the locations of the wells are presented in Figure 8.3. Several well owners reported elevated iron levels in groundwater in the area.

Table 8.3 Details of Well Survey

BH ID	Easting	Northing	Site Owner	Well /Mains	Use	Depth (m)	Diameter (m)	Well Type Bored /Dug	Water Level (mbgl)*	Comments
DW1	213596	219195	Laides	Well	Domestic & Agricultural		-	Unknown	Measurement not possible	Not at home
DW2	213565	219125	Byrnes	Well	Domestic & Agricultural		-	Unknown	Measurement not possible	Not at home
DW3	213624	219132	James Roche	Well	Domestic	15.4	-	Bored	Measurement not possible	-
DW4	210579	219060	Valerie James	Well	Domestic		-	Bored	2.93	-
DW5	213476	219031	Pat Barret	Well	Domestic	20.0	-	Bored	Measurement not possible	-
DW6	213473	218978	Joe Peavoy	Well	Domestic	11.8	-	Bored	1.77	-
DW7	213478	218949	Patricia Kershaw	Well		5.4	0.75	Dug	Measurement not possible	-
DW8	213429	218977	-	Well			-	Bored	Measurement not possible	Not at home
DW9	213280	218853	Guinan	Well	Domestic & Agricultural		-	Bored	Measurement not possible	-
DW10	213246	218922	Francis Gilligan	Well	Agricultural only		-	Dug	Measurement not possible	-
DW11	213318	218920	Gilligans	Well	Domestic	23.4	-	Bored	1.742	-
DW12	213593	218759	Pat Gilligan	Well	Domestic	4.5	1.00	Dug	Measurement not possible	-
DW13	213546	218837	School	Well	School Supply	-	-	Unknown	Measurement not possible	-
DW14	213732	218739	Michael Guinan	Well	Agricultural only	34.5	-	Bored	1.32	-
DW15	213847	218757	Michael Guinan	Well	Domestic	12.1	-		Measurement not possible	-
DW16	213883	218604	Thomas Camon	Well	Domestic & Agricultural (supplies 3 properties)	61.0	-	Dug	Measurement not possible	-
DW17	214529	216906	Martina & Enda Egan	Well	Domestic	49.0	-		Measurement not possible	-
DW20	214323	221249	Lally	Well	Domestic & Agricultural	-	-	Bored	Measurement not possible	-
DW23	213717	221335	Sean McGovern	Well	Domestic & Agricultural	-	1.00	Dug	Measurement not possible	High iron - not in use most of time

*mbgl – metres below ground level

The GSI groundwater database indicates a number of source protection areas for public water supplies (PWS) and group water schemes (GWS) in the region. The Kilcormac PWS and Ballyboy GWS are located approximately 7km to the south-east. The Holmshill and Agall spring Source Protection Areas are located approximately 13km to the east of the site, while the Tully source is located approximately 15km to the south-east. None of the source protection areas for these supplies incorporate the site area.

8.3.8 Groundwater quality

Groundwater in the area has a calcium-bicarbonate signature and is very hard (typically ranging between 380–450 mg/l as $CaCO_3$), with high electrical conductivities (650–800 µS/cm), alkalinity (250-370 mg/l as $CaCO_3$) and pH is generally neutral (GSI, 2003).

Groundwater sampling was undertaken across the site of the former peat plant during site investigations undertaken by the ESB as part of exit audits in 2004. (A contamination assessment was undertaken as part of this EIS, the details of which are provided in Chapter 7 – Soils & Geology). All groundwater samples taken as part of previous investigations were from lands outside the boundary of the proposed development site as no boreholes were situated on the proposed site development area. Given the proximity of the sampling locations to the proposed development site it is assumed that the results are indicative of groundwater quality at the proposed development site.

The results were compared with the EPA Interim Guideline Values for Groundwater (IGVs) (EPA 2003) and EU Drinking Water Regulations (S.I. No. 278 of 2007). The results indicate a neutral pH between 7.33 and 7.72. All parameter results except ammoniacal nitrogen, nitrite, manganese, arsenic, nickel and hydrocarbons were below the relevant IGVs and drinking water limits.

The concentration of ammoniacal nitrogen exceeded the IGV and drinking water limit in all samples taken with a mean concentration of 2.5mg/l and a maximum concentration of 5.1mg/l in a borehole on the former ash field site approximately 450m south east of the proposed development site. The widespread distribution of elevated ammoniacal nitrogen suggests that it is likely to be related to former activities at the station. The source may be leaching of nitrogen compounds from the peat deposits near the station (ESB, 2005). The source could also be slurry and fertilisers from agricultural activities in the area.

Manganese concentrations were found to exceed the IGV and Drinking Water limits in samples taken from boreholes approximately 200m south of the site and in a borehole approximately 40m east of the site. This could be naturally occurring or a result of the former station activities. Elevated manganese is often found under anaerobic conditions in limestone aquifers.

Slightly elevated arsenic levels and elevated nickel levels were found in boreholes approximately 100m to the south of the proposed development site at the former station dump.

Hydrocarbons were detected in one borehole close to the site of the former station dump.

A sample was taken from the proposed supply well at the site on 12th June 2009. Unstable parameters (temperature, pH, electrical conductivity and dissolved oxygen) were measured in the field. The sample was analysed for a set of indicator parameters.

The results were compared with Interim Guideline Values for Groundwater (IGVs) and the parameters as specified in the Drinking Water Regulations (S.I. No. 278 of 2007). While it is not proposed to use the borehole as a drinking water supply, the drinking water limits were used for indicative purposes. All parameter results except for Total Ammonia and Manganese were below the relevant IGV and Drinking Water limits. Ammonia concentrations exceeded both the IGV and Drinking Water limit and could be a result of past activities at the site or from agricultural activities in the wider area. Manganese concentrations exceeded the IGV and the Drinking Water limit. These levels could also be a result of past activities at the site or due to a result of agricultural impact.

The water quality results from the pumping test are summarised in Table 8.4 below. Certificates of this analysis and previous analyses from the on-site monitoring wells are included in Appendix 8.1 and Appendix 8.2 respectively.

Table 8.4 Hydrochemical Results for On-Site Borehole

Parameter	Units	Limit of Detection	Sample Results 12/06/09	IGV	SI No. 273 of 2007
pH	pH units	<0.01	7.46	≥6.5 and ≤9.5	≥6.5 and ≤9.5
Electrical Conductivity at 25 °C	µS/cm	<100	652	1000	2500
Sulphate	mg/l	<0.05	98.96	200	250
Chloride	mg/l	<0.3	20.9	30	250
Nitrate as NO3	mg/l	<0.2	0.4	25	50
Nitrite as NO2	mg/l	<0.02	0.03	0.1	0.5
Orthophosphate as PO4	mg/l	<0.06	<0.06	0.03	-
Total Ammonia as NH_4	mg/l	<0.2	2.9	0.15	0.3
Total Dissolved Solids	mg/l	<35	390	1000	-
Total Alkalinity as $CaCO_3$	mg/l	<1	232	NAC	-
Total Organic Carbon	mg/l	<2	3	NAC	NAC
Total Hardness	mg/l	<1	276	-	-
Calcium#	mg/l	<0.03	81.88	200	-
Magnesium#	mg/l	<0.02	17.09	50	-
Potassium#	mg/l	<0.04	3.6	5	-
Sodium	mg/l	<0.15	24.96	150	200
Iron#	µg/l	<20	<20	200	200
Manganese#	µg/l	<2	260	50	50
Extractable Petroleum Hydrocarbons (C_8-C_{40})	µg/l	<10	<10	10	-
Mineral Oil	µg/l	<10	<10	10	-

*NAC – no abnormal change
- Dissolved

8.4 IMPACT ASSESSMENT

The impacts of the proposed development on the hydrogeological environment were assessed as per the methodology described above. Potential impacts from the proposed development on the hydrogeological environment that were considered in this assessment are mainly the following: potential impact on third party wells in the area and flows in the Silver River from the proposed groundwater abstraction, impacts on groundwater quality from accidental spillages and leaks of chemicals/fuel and disturbance of contaminated ground during construction. These potential impacts are discussed below.

8.4.1 Construction Phase

8.4.1.1 Contaminated Soils

The disturbance of contaminated soil during construction has the potential to impact on groundwater quality where contaminants are leached to the water table. A contamination assessment was undertaken for the proposed development site as part of this EIS. This is reported on in Chapter 7 - Soil & Geology. The extent of contamination of soils was assessed to be low level. The contamination comprises principally hydrocarbon, low-level metal and phenol contamination in limited areas of the site. The underlying clay subsoils will reduce migration of any contaminants to groundwater.

The 2008 Summary Environmental Exit Audit Report (URS 2008) states no evidence of chemical contamination in soil that would limit redevelopment of the subject area for commercial or industrial use. Based on the limited area of deposits, low level requirement for excavation and low level nature of the contamination, it is anticipated that there will be a **negligible** impact to groundwater quality from disturbance of soils during construction.

Any domestic wells identified are located upgradient of the proposed development and any potential groundwater contamination during construction will therefore not migrate towards these wells.

8.4.1.2 Accidental Spillages and Leaks

There is a potential impact on groundwater quality from accidental spillages or leaks from vehicles or chemical materials used on site during the construction phase. Possible pollutants include fuels, lubricants and hydraulic fluids from equipment used in construction, uncured concretes and grouts and waste from toilet and wash facilities on site. With mitigation measures described below this impact is considered to be **negligible.**

8.4.1.3 Process Wastewater

During plant commissioning larger quantities of effluent will be produced related to plant cleaning procedures (e.g. condensate resulting from pre-operational steam blowing of steam piping). This has the potential to impact on groundwater quality if not treated and disposed of appropriately. If not classified as hazardous liquid waste, these effluents will be diverted to the process wastewater treatment plant. With mitigation measures described below this impact is considered to be **Negligible.**

8.4.1.4 Surface Water Drainage

Surface water which accumulates on site during construction has the potential to impact on groundwater quality if not contained, treated or discharged appropriately. The impact associated with this is considered to be **Negligible.**

Table 8.5 Summary of Impacts during Construction Phase

Magnitude of Impact	Criteria	Residual Impact
Significant Adverse	Results in loss of attribute	None
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	None
Slight Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Temporary impacts on groundwater quality as a result of accidental spills/leaks of fuel/chemicals to groundwater during construction
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	There will be a temporary negligible impact on groundwater quality as a result of disturbing localised areas of contaminated soils during construction. There will be a temporary negligible impact on groundwater quality due to any accidental spills or leakages during construction There will be a temporary negligible impact on groundwater quality as a result of disposal of process wastewater during construction There will be a temporary negligible impact on groundwater quality from potentially contaminated surface water
Minor Beneficial	Results in minor improvement of attribute quality	None
Moderate Beneficial	Results in moderate improvement of attribute quality	None
Major Beneficial	Results in major improvement of attribute quality	None

8.4.2 Operational Phase

8.4.2.1 Groundwater Abstraction

It is proposed to use an existing borehole on the site of the proposed development for use as cooling water in the proposed plant. Supply for domestic purposes only will be obtained from the Leabeg-Leamore Group Scheme which is supplied by the Agall Spring, Holmshill and Tully sources.

The proposed on-site abstraction well is referred to as PW1 for the purposes of this report. The location of this well is shown in Figure 8.3. The average daily water requirement will be $96m^3$. The abstracted groundwater will be demineralised on site to achieve high purity.

The well was previously used for abstraction by the ESB during operation of the peat plant. Abstraction volumes were believed to be four times greater than that required by the proposed development.

A pumping test was undertaken on the proposed abstraction well in order to establish if the well could deliver the volume of water required and to assess the impact, if any, of the pumping well on surface water flows in the nearby Silver River and local domestic wells.

It is proposed to discharge treated process waste water from the proposed plant to the Silver River. The capacity of the Silver River to assimilate the waste is based on flows in the River. This is considered in detail in Chapter 9 – Hydrology. However the potential impact of the groundwater abstraction on the River low flows and consequently its assimilative capacity are considered here.

A 72-hour pumping test on the PW1 commenced on 9th June 2009. The static groundwater level (prior to commencement of the test) in the well was 1.01m below ground level (bgl). The well was pumped at approximately $100m^3/d$ for the first 60minutes. The water level in the well was 1.22m bgl after 60 minutes, equating to a drawdown of 0.21m. The pumping rate was increased to approximately $245m^3/d$ for the next 60 minutes. The water level after this period was 1.74m bgl, equating to a drawdown of 0.73m. The pumping rate was further increased to $500m^3$/day. After 60 minutes at this pumping rate the water level was 2.01m, with a drawdown of 1.00m. These initial steps were completed to gauge the overall productivity of the well.

The pumping rate was then reduced to approximately $100m^3/d$ for the remainder of the test period which was used to represent the operational abstraction from the well. Water levels had stabilised by the end of the test period. The final water level in the well after 72 hours was 1.70m, giving a total drawdown of 0.69m. A graph of time versus drawdown for the first 300 minutes of the test is shown in Figure 8.4. A graph of the entire pumping test is shown in Figure 8.5. Pumping test data is included in Appendix 8.3.

The pump was switched off after 72 hours and the recovering water levels were monitored for 24 hours. Water levels recovered to within 0.07m of static water levels after 24 hours. A graph of time versus residual drawdown for the recovery period is shown in Figure 8.6 and recovery test data is included in Appendix 8.4.

Observation well measurements were taken from an existing site investigation borehole to the east of the proposed development site. The observation well is referred to as OBW1 for the purposes of this report. The observation well is located approximately 40m to the east of the eastern site boundary and located between the pumping well and Silver River (see Figure 8.3). The static water level in OBW1 prior to commencement of the pumping test was 3.01m bgl. The water level in OBW1 fluctuated between 3.01m bgl and 3.06m bgl. A graph of the water levels in the observation well for the duration of the test period are shown in Figure 8.7. The fluctuations in water level in OWB1 are closely related to the Silver River water level measured during the same period. There is no indication of an impact on the water table at OBW1 as a result of the pumping test.

Assessment of the pumping test data indicates the well can sustain the proposed abstraction rate of 96m^3/day. Analysis of the recovery test data indicates a transmissivity of 130m^2/d. The observation well data shows minimal impact on water levels during the pumping test. However, it is not possible to determine if the impact was naturally occurring or a result of the pumping well. It does confirm that the cone of drawdown from the pumping well had not extended significantly to the observation well, and is therefore unlikely to impact on the Silver River which is further east from the pumping well that the observation well.

The dry weather flow (DWF) and 95%ile flow for Millbrook gauging station (approximately 1.5km upstream the Silver River at the proposed development site) is 250l/s (216,000m^3/d) and is 500l/s (432,000m^3/d) respectively. These figures are used for the dry weather flows for the Silver River at the proposed development site. These figures are, therefore, conservative for the Silver River at the proposed development site. The proposed abstraction rate for the on-site borehole is 96m^3/d. This equates to 0.04% and 0.02% of the DWF and 95%ile flow respectively.

In addition process water will be discharge to the Silver River at a down stream location. Therefore any minor impacts on flow in the river will be very localised.

It is anticipated that the impact of the groundwater abstraction on the flow in the River Silver will be **negligible.**

8.4.2.2 Third Party Groundwater Resources

The observation well data indicates that a significant cone of drawdown had not developed to the east of the abstraction well during the pumping test. The nearest third party well is located 450m upgradient of the site. The impact of the proposed abstraction on water levels in neighbouring wells is predicted to be to be **negligible.**

8.4.2.3 Fuel and Chemical Storage

A number of chemicals will be stored on the site during regular operation including chemicals for water treatment and boiler dosing. An assortment of lubricants, oils and greases will also required storage on site.

In addition diesel will be stored on site to be used as a back up fuel in the event of interruption to the natural gas supply in order comply with the Commission for Energy Regulation (CER) Regulations. Five days running capacity (approximately 5,000m^3) of diesel will be stored on the site.

As a result of the above materials the site will be classified as lower tier COMAH in accordance with European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2006 (S.I. No. 74 of 2006).

There is potential for contamination of groundwater in the event of an accidental spillage or leak of any of the above materials. However, with the mitigation measures outlined below, the impact is considered to be **Slight Negative.**

8.4.2.4 Process Wastewater

Process wastewater consists of wastewater from the demineralisation plant and wastewater generated from boiler blow-down. Typical normal wastewater volumes generated is approximately 96m^3 per day. Process effluents from the plant will be routed via the on-site process wastewater treatment plant to effluent drainage system. Treated process wastewater will then be discharged via the wastewater collection system to the Silver River via the discharge point located in the north eastern corner of the site.

Chemical feed area drainage consists of spillage, tank overflows, maintenance operations and area wash-downs. This wastewater will be contained and collected in a bund area and the drainage manually emptied by means of a mobile drainage pump. General plant drainage consists of effluents produced by sample drains, equipment drains, equipment leakage, area wash-downs, etc. This effluent will be collected in a system of floor drains and sumps and routed to the condensate pit which represents the lowest drainage point in the plant. From there it is delivered to the wastewater treatment plant via a water/oil separator. This wastewater will be treated and discharged to the Silver River. There will be no direct discharge of process wastewater to ground. Mitigation measures are incorporated in the design for accidental leaks. Therefore, the impact is considered to be **Slight Negative.**

8.4.2.5 Surface Water Drainage

The surface water drainage system will collect all run-off from roofed and paved areas of the proposed development site and be discharged to the Silver River via the stream in the north eastern corner of the site. Large external areas/compounds at the site will be surfaced with stone to allow rainwater to percolate to the underlying soils. Where these coincide with areas of historical hydrocarbon contamination there is a potential for leaching of hydrocarbons to groundwater. However percolation of surface water in this area is ongoing under natural conditions and no additional impact is predicted as a result of the development, therefore, the impact is considered to be **Negligible.**

8.4.2.6 Domestic Wastewater

Domestic water, which comprises wastewater other than process waste water and surface water, will be treated in a proprietary treatment system prior to discharge. It is planned that the treated wastewater will be discharged to the Silver River via the drainage ditch located along the northern boundary of the site. However, the option of percolating to ground may also be considered at detailed design stage following completion of a site suitability assessment, including percolation testing, which will be undertaken to determine the suitability of the site.

If the site is suitable for percolation further treatment will be afforded by the filtration of the wastewater through the soils. The resulting impact on groundwater quality of treated wastewater discharging through suitable soils in a well constructed and maintain on-site septic system is considered to be **negligible.**

8.5 MITIGATION MEASURES

8.5.1 Construction Phase

8.5.1.1 Accidental Spillages and Leaks

An environmental management plan will be implemented during construction which will minimise the potential for and impact of any accidental spills/ contamination. Measures will include the following:

Chemicals and other construction materials will be safely stored to ensure the risk of oil or chemical contamination of soil is minimised.

Appropriate measures will be put in place to minimise the risk of soil contamination from re-fuelling of vehicles, e.g., re-fuelling to be undertaken in designated areas with drained hard standing, and spill kits in place.

Good housekeeping (daily site clean-ups, use of disposal bins, etc.) on the project site, and the proper use, storage and disposal of many substances used on construction sites, such as lubricants, fuels and oils and their containers can prevent soil contamination.

A contingency plan for pollution emergencies will also be developed by the appointed contractor prior to work and regularly updated, which would identify the actions to be taken in the event of a pollution incident. The CIRIA document (CIRIA 2001) recommends that a contingency plan for pollution emergencies should address the following:

- Containment measures;
- Emergency discharge routes;
- List of appropriate equipment and clean-up materials;
- Maintenance schedule for equipment;
- Details of trained staff, location, and provision for 24-hour cover;
- Details of staff responsibilities;
- Notification procedures to inform the relevant environmental protection authority;
- Audit and review schedule;
- Telephone numbers of statutory water undertakers and local water company;
- List of specialist pollution clean-up companies and their telephone numbers.

8.5.1.2 Process Wastewater

Any effluent waste not classified as hazardous liquid waste produced during plant commissioning will be diverted to the process wastewater treatment plant.

8.5.1.3 Surface Water Drainage

During the construction phase, all surface water will be contained on site with the use of berms and will be settled prior to discharge. Water with suspended solids will be completely enclosed within the site. There will be settlement lagoons located at the lowest elevations within the site. Oil separators will be installed to treat waters originating from all areas where there is a risk of hydrocarbon pollutants.

8.5.2 Operational Phase

8.5.2.1 Fuel and Chemical Storage

A back up supply of diesel (5,200m^3) is required at the site in the event of an interruption of the gas supply. All appropriate measures will be taken to minimise the risk of accidental spillages or leaks. The fuel will be stored in a cylindrical steel tank within a 110% capacity bund to comply with bunding requirements. The bund will be constructed in accordance with CIRIA Report 163 "*Construction of Bunds for Oil Storage Tanks*" and BS8007:1987 "*Code of Practice for Design of Concrete Structures for Retaining Aqueous Liquids*". The diesel oil will be limited to 0.1% sulphur as per the requirements of EU Directive 1999/32/EC (relating to a reduction in the sulphur content of certain liquid fuels)

The site will be classified as lower tier COMAH in accordance with European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2006 (S.I. No. 74 of 2006). In accordance with legislative requirements, a major accident hazard (MAH) report was prepared for the proposed development. This report details risk and consequence assessments for the site in accordance with the Health and Safety Authority (HSA) guidance document entitled 'Setting the Specified Area – The Approach of the HSA'.

8.5.2.2 Surface Water Drainage

Surface water from roofed and paved areas will be routed via an oil/water interceptor before being finally discharged through an attenuation tank (controlled discharge) to the Silver River via the stream in the north eastern corner of the site. In order to ensure that uncontaminated surface drains are not mixing with possibly oil contaminated surface drains, such 'oil risk areas' will discharge into a separate system. Small areas that have the potential for causing oil contamination of surface drain water will be separated from the overall surface water drainage. This comparably low volume of surface water with potential for oil contamination will be collected separately and routed through a water/oil separator and delivered to the plant's effluent sump. Any surface water indirectly discharging to ground will therefore be uncontaminated.

8.5.2.3 Domestic Waste Water

Domestic wastewater will be treated in an on site proprietary treatment system to suitable standards prior to discharge. Treated domestic wastewater will only be discharged to groundwater if percolation tests indicate the site is suitable for such.

8.6 RESIDUAL IMPACTS

There will be no likely significant hydrogeological impacts as a result of the proposed development.

There will be a temporary slight adverse impact on groundwater quality as a result of accidental spills/leaks of fuel/chemicals to groundwater during construction.

There will be a temporary negligible impact on groundwater quality as a result of disturbing localised areas of contaminated soils during construction.

There will be a negligible localised impact on flow in the Silver River as a result of the proposed groundwater abstraction.

There will be negligible impact on groundwater quality from potential accidental discharge of treated wastewater to ground.

Table 8.6 Summary of Residual Impacts on Groundwater

Magnitude of Impact	Criteria	Residual Impact
Significant Adverse	Results in loss of attribute	None
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	None
Slight Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Temporary impacts on groundwater quality as a result of accidental spills/leaks of fuel/chemicals to groundwater during construction
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Impact on flow in the Silver River as a result of the proposed groundwater abstraction There will be a temporary negligible impact on groundwater quality as a result of disturbing localised areas of contaminated soils during construction.
Minor Beneficial	Results in minor improvement of attribute quality	None
Moderate Beneficial	Results in moderate improvement of attribute quality	None
Major Beneficial	Results in major improvement of attribute quality	None

8.7 REFERENCES

- Environmental Protection Agency, 2002. *Guidelines on the Information to be contained in Environmental Impact Statements.*
- Environmental Protection Agency, 2003. *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements.*
- Environmental Protection Agency (EPA), 2003. *Towards Setting Guideline Values for the Protection of Groundwater in Ireland – Interim Report.*
- ESB International, July 2003. *Ferbane Generating Station – Environmental Exit Audit Phase 1 Report.*
- ESB International, May 2005. *Environmental Ground Investigation - Former Ferbane Generating Station Co. Offaly.*

- Geological Survey of Ireland (GSI), 2003. *Clara GWB – Summary of Initial Characterisation.*
- Geological Survey of Ireland (GSI), 2005. *Geology of Galway – Offaly Sheet No. 45. (1:100,000 scale maps).*
- Shannon International River Basin District Project, December 2008. *"Draft River Basin Management Plan for the Shannon International River Basin District".*
- URS Ireland, June 2005. *Environmental Exit Audit Summary Report – Ferbane Generating Station, Co. Offaly.*
- URS Ireland, June 2005. *Environmental Site Assessment of Station Dump Area – Former ESB Generating Station, Ferbane, Co. Offaly.*
- URS Ireland, April 2008. Letter Report – *ESB Ferbane Site Inspection*.
- URS Ireland, April 2008. *Summary Environmental Exit Audit Report – Northern Portion of Former ESB Generating Station, Ferbane, Co. Offaly.*
- Environmental Protection Agency Ireland (EPA) website - www.epa.ie
- Geological Survey of Ireland (GSI) website – www.gsi.ie

9.0 HYDROLOGY

9.1 INTRODUCTION

This chapter of the EIS describes the existing hydrological environment and includes a Hydrological Impact Assessment which assesses and evaluates the potential impact of this development on surface water quality and hydrological characteristics of the receiving surface water environment.

9.2 METHODOLOGY

9.2.1 Baseline

The chapter has been prepared in accordance with the following guidelines:

- Environmental Protection Agency (EPA) *Guidelines on the Information to be Contained in Environmental Impact Statements* (2002);
- Environmental Protection Agency, (EPA) *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements* (EPA, 2003);

Consultation was carried out with the relevant bodies as detailed below. Consultees contacted for the purposes of the hydrological assessment were:

- Office of Public Works;
- Fisheries Board
- Department of Environment, Heritage & Local Government (DoEHLG);
- Environmental Protection Agency (EPA);
- Offaly County Council.

Consultation was also undertaken with other specialists in order to assess the impact of the interaction with other environmental factors. This included consultation with the hydrogeology specialist in relation to contaminated ground and the potential risk to groundwater quality, and the ecology specialist in relation to the potential impact to the ecological interactions.

9.2.1.1 Study Area and Baseline Data Collection

A desk study was undertaken for the proposed development site and the associated surface water environment. A site walkover was undertaken by WYG personnel in February 2009 and hydrological monitoring was undertaken for a period of three weeks in parallel to a pumping test at the site.

The following is a list of the sources of information used for the hydrological assessment.

- Office of Public Works – Gauging Station database , Historical Flooding database, Drainage Scheme data for the Silver River
- Environmental Protection Agency (EPA) – Q-Rating of Rivers, Risk Assessment of River Water Bodies;
- Offaly County Council – Water Services Section – 10 Years of monthly physio-chemical data
- ESB Exit Audit Reports: Phase 1 (July 2003) and Phase 2 (May 2005);
- URS Ireland Site Assessment (June 2005) and Exit Audit Summary Reports (June 2005 & April 2008) Letter Report (April 2008);
- Feedback from consultations with statutory consultees, interested organisations and affected third parties.

This information was used to describe and evaluate the hydrological environment at the proposed development site and in its vicinity and to identify and categorise the likely significant impacts of the proposed development on this environment.

9.2.2 Impact Assessment

The potential impacts of the proposed development on the surface water environment were assessed as per the criteria for impact assessment provided in "*Guidelines on the Information to be Contained in Environmental Impact Statements*" (EPA 2002). The impacts are described by identifying three key aspects as follows:

- Beneficial, adverse or neutral – The impacts were assessed as being beneficial, adverse or neutral.
- Impact Magnitude – The magnitude of each impact was considered as being Negligible, Slight, Moderate or Significant in the case of negative impacts. The magnitude was considered as being minor, moderate or major in the case of beneficial impacts. The criteria for determining the magnitude of the impacts is summarised in Table 9.1 below.

Table 9.1 Criteria for Assessing Impact Magnitude

Impact Magnitude	Criteria
Significant Adverse	Results in loss of attribute
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute
Slight Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity
Minor Beneficial	Results in minor improvement of attribute quality
Moderate Beneficial	Results in moderate improvement of attribute quality
Major Beneficial	Results in major improvement of attribute quality

- Duration – The duration of each impact was considered to be either temporary, short-term, medium term, long-term or a permanent impact. Temporary impacts are considered to be those which are construction related and last less than one year. Short term impacts were seen as impacts lasting one to seven years. Medium-term impacts are impacts lasting seven to fifteen years. Long-term impacts are impacts lasting fifteen to sixty years and permanent impacts are impacts lasting over sixty years.

Where a significant impact is anticipated, mitigation measures are proposed to minimise the effect of the impact.

9.2.3 Hydrometric Assessment & Water Quality Assessment

Ireland is divided into numerous hydrometric areas, each of which consists of a single river catchment or a number of smaller ones. The Environmental Protection Agency (EPA), the Office of Public Works (OPW), the Electricity Supply Board (ESB) and the Local Authorities operate an extensive network of water level recorders on rivers and lakes throughout Ireland and hydrometric data is measured at various points, known as hydrometric stations, along these watercourses. Data from the local hydrometric station combined with physicochemical data, from Offaly County Council, was used in conjunction with indicative waste water loading figures to determine the potential impact on the Silver River in assessing its assimilative capacity discharge

9.2.3.1 Biological Assessment

The biological assessment used by the EPA is known as the Q-Rating system. The Q-Rating system refers to a biological rating system for freshwaters where the presence and quantity of suitable resident organisms, primarily readily visible invertebrates, are surveyed. Different species show different levels of tolerance and sensitivity to pollution. As such, the presence or absence of specific organisms in the water indicates the level of pollution in the watercourse. The Q-Rating system measures the effects of pollution by condensing biological information into a readily understandable form by means of a 5-point biotic index (Q-Values), an arbitrary system in which biodiversity and water qualities are related, as described in Table 9.3, Q-Rating System and Water Quality.

9.2.4 Legislation and Guidance

The following section describes the legislative context of the assessment in relation to surface water quality and quantity.

- **Water Framework Directive 2000/60/EC and SI 722 of 2003 European Communities (Water Policy) Regulations 2003 – 2005**

  The EU Water Framework Directive 2000/60/EC came into force on 22nd December 2000, and enacted into Irish legislation through SI 722 of 2003 European Communities (Water Policy) Regulations 2003. This legislation and regulation is a significant piece of legislation for water policy, as it provides a co-ordinated approach across Europe for all water policies, establishing a management structure for future water policy. A few key objectives of the Directive are to:

  - protect all waters, including rivers, lakes, groundwater, transitional and coastal waters;
  - achieve "good status" in all waters by 2015, and maintaining "high status" where the status already exists
  - have water management based on River Basin Districts (RBD)

- **Draft European Communities Environmental Objectives (Surface Waters) Regulations 2008**

  These regulations have been devised as a more complete and stringent set of surface water quality regulations which covers the requirements of the Water Framework Directive and the Dangerous Substances Directive. Currently these regulations are in draft form and have not yet been adopted by the Government. However, the monitoring regime to be devised for construction and operation activities will be cogniscant of these new regulations and apply them throughout the construction water quality monitoring programme.

- **SI 293 of 1988 European Communities (Quality of Salmonid Waters) Regulations 1988**

  The Salmonid Regulations set water quality standards for salmonid waters, with identification of salmonid waters, water quality standards, and frequencies of sampling and methods of analysis and inspection.

- **Local Government (Water Pollution) Acts 1977 – 1990**

  The Act is the main legislation for the prevention and control of water pollution, including the general prohibition of polluting matter to waters, licensing discharges, fines and prosecution, water quality standards and management plans.

- **SI 258 of 1998 Water Quality Standards for Phosphorus Regulations 1998**

  As part of the Water Pollution Acts, these regulations require water quality be maintained or improved, with reference to the biological quality river rating system as assigned by the Environmental Protection Agency between 1995 to 1997. Table 9.3 provides further details on biological indices.

  Under the Water Framework Directive 2000/60/EC, and SI 722 of 2003 European Communities (Water Policy) Regulations 2003, the water quality of River Basin Districts is assessed biologically, physically and chemically. Assessment using surveys is predominately conducted by the EPA and local authorities, and complemented by other government bodies including the Fisheries Board and the Marine Institute. Table 9.3 summarises the quality classes used to establish and monitor the condition of rivers and streams in Ireland. Note that for biological monitoring purposes, macroinvertebrates are used and are defined as animals without backbones that are big enough to see with the naked eye, with examples including most aquatic insects, snails and crayfish (Washington State Digital Archives, 2009).

9.3 RECEIVING ENVIRONMENT

9.3.1 Development Site

A full description of the proposed development is included in Chapter 2 of this EIS, Description of the Proposed Development.

The site is a brownfield site of a former ESBI 80MW milled peat fired power plant which was built in 1957 and demolished in 2002. While the majority of the site appears to be permeable there are large areas of hardstandings and pools of water throughout the site. The topography of the site is generally very flat with the exception of a small embankment that runs along the north-east boundary.

Figure 9.1 Site View (view from East to West)

The most noticeable hydrological features within the site consist of two drainage ditches, one larger one which runs in parallel to the R357 along the northern site boundary and a second small one, which runs along the south eastern boundary of the site along the access road.

The large drainage ditch receives road runoff as well as runoff from the site and discharges to the Silver River via an existing settlement chamber that is located within an enclosed compound adjacent to the Silver River. The settlement chamber consists of 4 sections with a manual 600mm diameter shut-off valve as outlet. Although the shut-off valve is leaking, the settlement chamber is full and appears to be overspilling during wet weather conditions. As a result surface water is stagnant within the drainage ditch with elevated water levels within the site.

Changes in the hydrological regimes can occur due to alterations in the surface water drainage patterns. The conversion of relatively permeable green-field areas into impermeable surfaces, such as road and roof surfaces can result in an increase in the runoff in terms of peak flow and flow volume.

9.3.2 Hydrological Catchment

The Silver River discharges into the Brosna River and is located within the Shannon International River Basin District (ShIRBD). The ShIRBD is the largest river basin district in Ireland, comprising a land area of approximately 18,000 km^2 of which 2000 km^2 is currently peatland and includes an extensive area of central Ireland, from its origin in County Cavan to the mouth of the Shannon Estuary.

The Silver River rises in the Sleeve Bloom Mountains and flows in a northerly direction through Kilcormac towards Lumcloon and joints the River Brosna approximately 3km downstream from the Lumcloon Bridge. The Silver River has a main river length of approximately 35km, an average slope of 5m/km and a catchment area of 157km^2. Flow recordings are taken from the gauging station record at Millbrook (OPW, 2009) located approximately 1.5km upstream from the site and these are expected to be representative of flows at the site location. The annual discharge of the Silver River at the site as estimated to be 2.4m^3/s.

Figure 9.2 Catchment View from Sleeve Bloom Mountains

The lower lying catchment is characterised by large areas of peatland, which is the reason for the dark/ brownish colour of the Silver River in the vicinity of the site and this is caused by high concentrations of dissolved organic matter in peatland runoff.

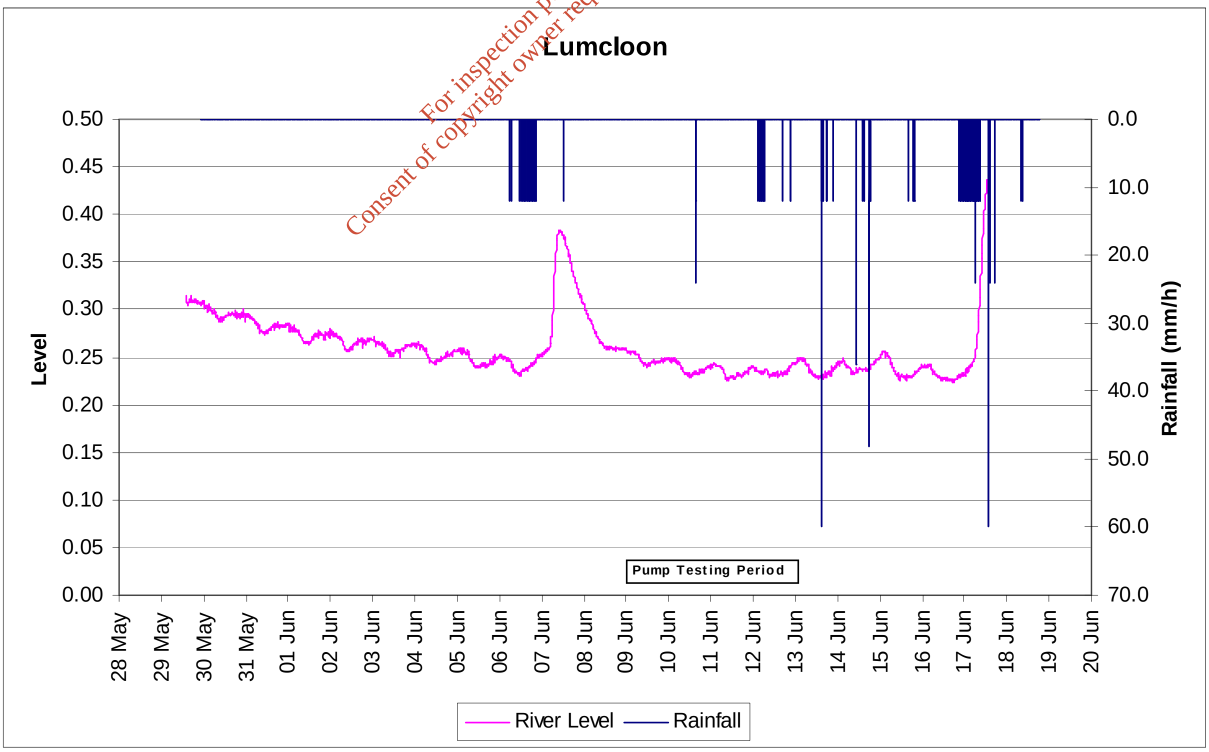
In terms of freshwater enrichment, peat is not considered a pollutant. Being basically solids suspended in water, it can be deposited at areas along watercourses and cause the clouding of water where it is not treated. The main concern with peat silt entering river systems is the impact it can have on aquatic life such as fish, particularly if it settles in spawning areas. High concentrations of peat silt in surface waters can kill fish by clogging up gills and or making it impossible for the fish to feed.

9.3.3 River Flows

The gauging station at Millbrook (25014) provides annual maximum data for flow and water level data for a period of 56 years, from 1951 to 2005. The EPA undertook a dry weather flow assessment of 250 l/s (98%-ile flow) and 500 l/s for the 95%-ile flow. Peak flows range from 11 to 27m^3/s and maximum water levels at Millbrook range from 45.88 to 46.91mOD (Malin).

Water level and rainfall monitoring was undertaken as part of the baseline sampling and Figure 9.3 presents the findings. Monitoring was undertaken from the 29th May 2009 until the 17th June 2009 during a period that was relatively dry. One rainfall event was recorded from the 6th – 7th June with a rainfall depth of just under 9mm and this corresponds to a water level rise of just under 150mm. It is interesting to note that water levels in the Silver River display a diurnal pattern and this may be due to the influence of a water supply scheme at Kilcormac (please refer to Chapter 8 Groundwater for further information).

Figure 9.3 Rainfall and water level monitoring of the Silver River at Lumcloon

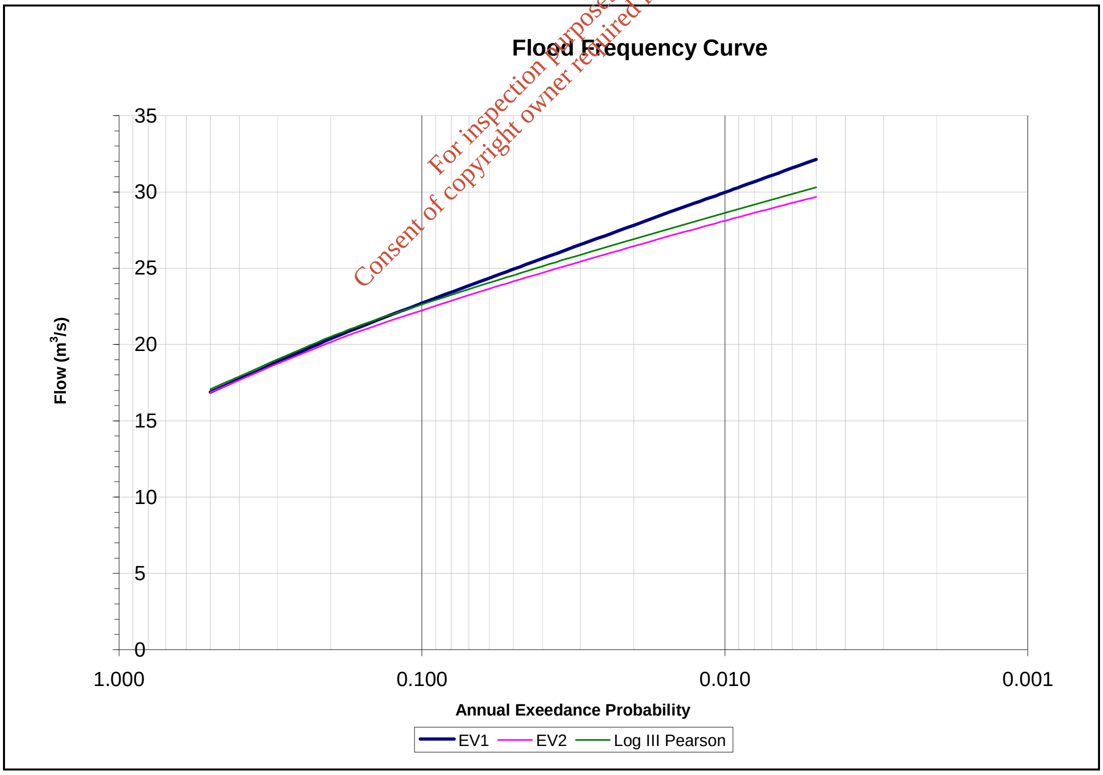


Consultation with the Office of Public Works (OPW) was undertaken from an early stage of the project and the OPW advised that gauging station records from the station at Millbrook should be used to derive a flood frequency curve. Different flow estimation methods are required and relevant standard errors should be taken into account. In addition, a district drainage factor, climate change scenario and freeboard should also be applied.

The OPW also supplied information on the Silver River from the District Drainage Scheme, in form of hardcopy records and this information was useful in determining the slope and shape of the river. The two river crossings and a typical cross section were surveyed and a simple hydraulic model was developed in order to estimate the 100 year design flood level.

Three different statistical methods were applied to the annual maxima flow record and a flood frequency comparison was undertaken and this is presented in Figure 9.4. An Extreme Value analysis for the Gumbel distribution (EV1), the Weibull distribution (EV2) and the Log III Pearson distribution was used to predict design flows and results. Generally in Ireland the EV1 (2 parameter) distribution is applied for the majority of gauged rivers and findings show that this also provides the most conservative flood prediction at Millbrook.

Figure 9.4 Flood Frequency Curve Comparison



In order to provide a conservative design a district drainage factor, 95% confidence interval and climate change factor were also applied. Please see Appendix 9.2 for details on the flood assessment.

Results from our hydraulic modelling showed that the 100 year design flows the Lumcloon Bridge and the local access bridge are surcharge. However, no flooding of the site occurs for any of the design flows investigated. A freeboard of 500mm is adopted in addition to the 100 year flood level to estimate the proposed floor levels for the site and this should be set at minimum to 46.85mOD (Malin).

The results from this assessment are regarded as guidance values and will be confirmed following a more detailed bathymetric survey of the Silver River.

9.3.4 River Water Quality

Water quality of rivers in Ireland is assessed by the EPA using biological and physiochemical data. Physiochemical monitoring measures the causes of pollution and the quantity of pollutants while biological monitoring measures the effects of pollution on the ecological status of the water body.

The Q-value system describes the relationship between water quality and the macroinvertebrate community in numerical terms. Q5 waters have high diversity of macroinvertebrates and good water quality, while Q1 have little or no macroinvertebrate diversity and bad water quality. Intermediate values, Q1-2, 2-3, 3-4 etc denote transitional conditions.

The water quality of the Silver River is of High Status in its upper section as far as Ballyboy and this classification changes to Poor Status at Kilcormac, which is most likely due to the urban influence in this area. Water quality then improves to Good Status along the section of the proposed development and the Brosna River as receiving water is classified as High Status.

Stream Risk Assessments were developed by the EPA to determine the risk of streams failing to meet "Good Status" under the Water Framework Directive (WFD) based on the macroinvertebrate ecology. The Silver River and the Brosna River are both "at risk of not achieving Good Status" (EPA, 2005). The main tributaries of the Silver River are classified as "possibly at risk of not achieving Good Status" (EPA, 2005).

In addition, Offaly County Council supplied more detailed water quality information and this was available in monthly intervals from 1998 up to 2007 for the following parameters:

Ammonia (N), BOD, Chloride, Colour, Conductivity @ 25°C, Dissolved Oxygen % Saturation, Hardness, Nitrates (N), Nitrites (N), Ortho-Phosphate (P), pH, Suspended Solids, Temperature, Total Oxidised Nitrogen, Total Phosphorus, Un-ionised Ammonia,

This data is provided in Appendix 9.3 and was used to assess the assimilative capacity of the Silver River.

9.3.5 Assimilative Capacity

The assimilative capacity of the Silver River was determined based on the dry weather flow (also known as 98%ile flow) at the OPW gauging station at Millbrook (25014) and water quality data sampled by Offaly County Council at Lumcloon Bridge (see Appendix 9.3), which are approximately 1.5km apart. Water quality data was monitored on a monthly interval for a period of 10 years and the average concentration was adopted as background concentration for the Silver River.

The design flow was estimated applying a typical water usage for an office/ factory with canteen of 15 users per day with 60 litres per person per day, resulting in 900 litres discharge per day. The exact type of the proposed wastewater treatment plant was not set, however typical effluent concentrations based on the EPA wastewater manual – treatment systems for small communities was adopted with proposed effluent concentration as follows:

- BOD_5 5 mg/l,
- Suspended Solids 5 mg/l,
- Ammonia 5 mg/l,
- Orthophosphate 1 mg/l.

The assimilative capacity details are presented in Table 9.2.

Table 9.2 Assimilative Capacity, 0.9m^3/day

Parameter	Unit	Background Concentration in Silver River	Concentration of Effluent	Additional Concentration to Silver River	Future Concentration in Silver River	Water Quality Limits	Meeting WQ Limits
BOD	mg/l	1.60	5	0.00014	1.60	5	yes
Suspended Solids	mg/l	10.00	5	-0.00021	10.00	25	yes
Total Ammonia	mg/l	0.093	5	0.00020	0.093	1	yes
Ortho-phosphate	mg/l	0.013	1	0.00004	0.013	0.03	yes

Note Background concentrations are based on average of monthly samples over 10 year period

As demonstrated in Table 9.2, the resultant concentration for each parameter in the Silver River is within the set Water Quality Limits set by the European Communities (Quality of Salmonid Waters) Regulations 1988 and the Local Government (Water Pollution) Act, 1977. In addition, the background concentration and proposed future concentration in the Silver

River are almost identical and this is due to the small discharge volume in comparison to the relatively high dry-weather flows in the Silver. As a result the proposed discharge will have an imperceptible impact on the water quality of the Silver River.

Table 9.3 River and Stream Water Quality Classes (Clabby et al., 2004; Clabby et al., 2005)

Biotic Indices	Community Diversity	Quality Status	Condition
Q5	High	Good	Satisfactory
Q4	Reduced	Fair	Satisfactory
Q3	Low	Doubtful	Unsatisfactory
Q2	Very Low	Poor	Unsatisfactory
Q1	Little / None	Bad	Unsatisfactory

Where 'Condition' refers to the likelihood of interference with beneficial or potential beneficial uses. The intermediate values (Q1-2, 2-3, 3-4 etc.) below denote transitional conditions.

Biotic Indices	Quality Status	Quality Class
Q5, Q4-5, Q4	Unpolluted	Class A
Q3-4	Slightly polluted	Class B
Q3, Q2-3	Moderately polluted	Class C
Q2, Q1-2, Q1	Seriously polluted	Class D

Where biotic indices or Quality (Q) value indicates specified groups of macro-invertebrates sensitivity to pollution, with:

Q5 = Mostly pollution sensitive, a few to numerous less pollution sensitive, a few pollution tolerant, and no very pollution tolerant or most pollution tolerant macro-invertebrate species

Q4 = At least one pollution sensitive, few to numerous less pollution sensitive, numerous pollution tolerant, and a few or no very pollution tolerant or mostly tolerant macro-invertebrate species

Q3 = No pollution sensitive, few or no less pollution sensitive, dominant in pollution tolerant, a few to common in very pollution tolerant, and few or no most pollution tolerant macro-invertebrate species

Q2 = No pollution sensitive or less sensitive, few or no pollution tolerant, dominant in very pollution tolerant, and few to common in most pollution tolerant macro-invertebrate species

Q1 = No pollution sensitive, less sensitive, and pollution tolerant, a few to no very pollution tolerant, and dominant in most pollution tolerant macro-invertebrate species

Where a toxic effect is apparent or suspected, the suffix 0 is added to the biotic indices, for example Q2/0.

Quality classes relate to the potential beneficial use of a water body, with:

A = Highest water quality, suitable for abstraction, game fisheries, very high amenity value, orthophosphate ~ 0.015 mg P/L, dissolved oxygen close to 100%, maximum BOD is < 3mg/L

B = Variable water quality, potential problems for abstraction, game fish at risk, considerable amenity value, orthophosphate ~ 0.045 mg P/L, dissolved oxygen <80% to >120%, maximum BOD is occasionally elevated

C = Doubtful water quality, advanced treatment of abstracted water, coarse fisheries, reduced amenity value, orthophosphate ~ 0.070 mg P/L, dissolved oxygen is very unstable with potential fish kills, maximum BOD is high at times

D = Poor to bad water quality, low grade to limited abstraction, fish usually absent, low or no amenity, orthophosphate >0.1 mg P/L, dissolved oxygen is low to zero, maximum BOD is usually high to very high

9.3.5.1 Physio-chemical data

The physio-chemical assessment of water quality is based on an assessment of a number of water quality parameters with five primary parameters considered. These are Biological Oxygen Demand (BOD), Dissolved Oxygen (DO), Ammonia, Nitrate and Phosphorous.

The BOD test indicates the level of organic matter in the water and the amount of dissolved oxygen present. The greater the rate of loss of dissolved oxygen, the greater the amount of organic matter present. The BOD test therefore provides a good indication of the level of contamination of the water with biodegradable material.

Dissolved Oxygen (DO) is a measure of the oxygen in water which is readily available for fish and other aquatic organisms. The depletion of dissolved oxygen in water can be detrimental to aquatic life and occurs in response to the addition of excessive levels of nutrients arising from anthropogenic or natural sources. The addition of elevated levels of nutrients result in the excessive growth of macrophytes or algae which utilise the limited oxygen supply in the water and so depriving other aquatic species of oxygen.

Ammonium is non-toxic and not directly a threat to aquatic life. However, ammonium is a nutrient that can cause eutrophication in watercourses and a maximum concentration of 1mg/l (NH_4) is considered necessary for rivers (under the Surface Waters and the Salmonid Waters Regulations mentioned previously) during dry weather flow (DWF) conditions of a river.

Ammonia is toxic to aquatic life, and a maximum concentration of 0.02mg/l (NH_3) is considered necessary for rivers (per the Surface Waters and the Salmonid Waters Regulations) during dry weather flow conditions for a river.

Phosphorous is widely used in agricultural fertilisers and detergents. Significant phosphorous concentrations can lead to eutrophication and Ortho-phosphate is considered the most readily available form for algal growth.

Maintain the natural water temperature is considered necessary for rivers (per the Surface Waters and the Salmonid Waters Regulations) and a maximum increase of 1.5 Degrees Celsius at the edge of the mixing zone will not be exceeded.

9.4 IMPACT ASSESSMENT

9.4.1 Construction Phase

Chapter 3 of the EIS outlines the construction activities in detail. Chapter 9.5 outlines the mitigation measures that will be required to minimise any potential risk to the hydrological and consequently aquatic ecological environments during the construction phase of the proposed development.

There is potential for impact on the water quality of the Silver River during the construction phases of this project, as the Silver River forms part of the eastern site boundary. There is also a drainage channel that runs along the northern boundary and discharges to the Silver River. This could act as transport route for contaminants arising from the site during the construction phase.

The main potential impact on the receiving waters during the site clearance and construction phases relate to the release of sediment and other contaminants to the Silver River via drainage channels as detailed below:

- Silt: elevated silt loading in surface water discharge may result from construction activities. Elevated silt loading leads to long term damage to aquatic ecosystems by clogging the gills of fish and smothering spawning grounds. Chemical contaminants bind to the organic particles attached to silt which can lead to increased bioavailability of these contaminants.
- Cementing and/or grouting materials from construction works. This material is toxic in sufficient quantities and could potentially contaminate the riverbed sediments adjacent to the development, inhibiting recolonisation of the area after construction.
- Liquid cement also has potential to cause fish kills due to its highly alkaline and corrosive nature.
- Faecal coliforms: contamination from inadequate containment and treatment of on-site toilet and washing facilities.
- Hydrocarbons, oils and other chemicals: Through accidental spillage from construction plant, storage depots or poor management operation. However, if suitable precautions are taken and best practice for the storage, handling and disposal of such materials is followed, impacts should be minimal.

The above risks are considered as moderate negative temporary impacts. However these impacts can be negated and re-evaluated as an imperceptible negative temporary impact on the basis that the construction mitigation measures outlined in Chapter 9.5 are carried out. The extent of the risk of these impacts is determined by the proximity of the construction activity to the watercourse, and the sensitivity of the watercourse.

9.4.2 Operational Phase

The operation of the proposed development could result in rapid run-off of surface water. Surface water run-off from hardstanding areas is likely to contain mild contamination. Consequently the quality of surface water downstream and in close proximity to the proposed scheme could potentially be impacted by a number of different sources in the absence of appropriate mitigation measures, these potential sources include:

- Accidental spills of harmful substances such as petrol or oil during the delivery and storage of harmful substance or by leakages from construction machinery.
- Urban Runoff: routine urban runoff generally contains a variety of contaminants. These arise from material storage, operational activity, soil erosion and aerial deposition. The primary contaminants known to occur in routine road runoff include hydrocarbons, particulate matter and heavy metals.
- Unless adequately treated, wastewaters will have the potential for significant organic pollution and nutrient enrichment of the Silver River and a generalized nutrient enrichment effects on the Silver River downstream.
- Discharge of process water from the blow down of gas turbines and other operations has the potential to increase water temperature in the Silver river.

The above water quality risks are considered as moderate negative long term impacts (see Table 9.1). However these impacts can be overturned and re-evaluated as negligible impacts on the basis that the operation mitigation measures outlined in Section 9.5.2 are carried out.

9.5 MITIGATION MEASURES

9.5.1 Construction Phase

Prior to construction the Contractor will be required to:

- Prepare an Emergency Response Plan detailing the procedures to be undertaken in the event of a spill of chemical, fuel or other hazardous wastes, a fire, or non-compliance incident with any permit of license issues.
- Ensure staff are trained in the implementation of the Emergency Response Plan and the use of any spill control equipment as necessary.
- Prepare method statements for the control, treatment and disposal of potentially contaminated surface water.
- Obtain all necessary permits and licences for the Work.
- Prepare a site plan showing the location of the surface water drainage system and proposed discharge points. This will also include the proposed surface water protection measures, including monitoring points, sediment traps, settling basins, interceptors etc.

In addition, pollution of aquatic systems during the construction phase will be reduced by the implementation of the following best practice mitigation measures. Due cognisance is paid to the following guidance documents for construction work on or near water;

- Eastern Regional Fisheries Board - Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites;
- CIRIA – Guideline Document C697 The SUDS Manual;
- CIRIA – Guideline Document C624 Development and flood risk - guidance for the construction industry;
- UK Environment Agency – PPG5 Pollution Prevention Guidelines Works and Maintenance in or near Water.

Based on these guidance documents the following mitigation measures will be prescribed for the proposed development;

- Use of settlement feature, silt trap and bunding prior to discharge to the receiving watercourse.
- Where pumping of water is to be carried out, filters will be used at intake points and discharge will be through a sediment trap.

- Appropriate management of excess material stockpiles to prevent siltation of watercourse systems through runoff during rainstorms will be undertaken. This may involve allowing the establishment of vegetation on the exposed soil and surrounding stockpiles with cut-off ditches to contain runoff.
- All chemical and fuel fill points and hoses will be contained within bunded areas.
- Foul drainage from all site offices and construction facilities will be contained and disposed of in an appropriate manner to prevent pollution of the lake and local watercourses in accordance with the relevant statutory regulations.
- Adequate protection measures will be put in place to ensure that all hydrocarbons used during the construction phase are appropriately handled, stored and disposed of in accordance with recognised standards as laid out by the EPA.
- Routine monitoring of water quality will be carried out at appropriate locations during construction. Parameters to be monitored should include pH, total suspended solids, BOD and COD.
- All batching and mixing activities will be located in areas well away from watercourses and drains, if applicable.
- Surface water drainage around the batching plant will be controlled, if applicable.
- There will be no hosing into surface water drains of spills of concrete, cement, grout or similar materials.
- Washout from mixing plant of concrete lorries will be carried out in a designated, contained impermeable area.

9.5.2 Operational Phase

Mitigation measures for the operational phase relate to surface water runoff, discharge of process wastewater, foul effluent discharge and mitigation for flood risk from the Silver River.

All rainfall runoff will be prevented from discharging directly to the Silver River by the proposed drainage system as detailed on Planning Drawing Reference Numbers C007331-04, C007331-10 and C007331-16. The drainage system will consist of the following elements: attenuation tank of 1000m^3 to maintain the greenfield runoff rate of 5 l/s/ha as specified by Offaly County Council and a oil /petrol Interceptors for water quality improvement and to prevent pollutants from entering the receiving watercourses. The installation of emergency spill containment facilities will mitigate against any potential adverse impacts to the receiving surface waters arising from an accidental spillage associated with proposed development.

The new drainage attenuation system will be sized accordingly to accommodate any potential increase in surface water runoff and accommodate increased rainfall during storm events.

Proposed floor levels will be set 500mm above the estimated 100 year flood level of the Silver River.

Emission Limit Values (ELVs) for process wastewater discharge will be determined by the EPA under the IPPC licensing regime. Process wastewater will be cooled in the effluent retention pond prior to discharge to the Silver River to ensure that the effluent discharge does not cause a rise in temperature of more than 1^oC in the River outside the mixing zone.

A water quality monitoring programme will be developed for process wastewater and surface water run-off. Monitoring of the Silver River upstream and downstream of the wastewater discharge point will be undertaken on a periodic basis to determine the impact of the discharge on the receiving water. The parameters, thresholds and frequency of the monitoring programmes required will be detailed in the IPPC licence for the proposed development.

All bunds and chemical containers will comply with the appropriate standards. All bunds will be leak tested prior to commencement of operations and at a frequency thereafter to comply with the relevant conditions of the IPPC licence.

The discharge water pipeline will be inspected periodically, to comply with IPPC licence conditions.

9.5.3 RESIDUAL IMPACTS

No negative residual impacts to water quality and hydrological regime are anticipated, if all practicable mitigation measures as stated in Chapter 9.5 are implemented for the proposed development.

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10.0 FLORA AND FAUNA

10.1 INTRODUCTION

This chapter of the EIS describes the flora and fauna within and surrounding the study site at Lumcloon, Co. Offaly. This Ecological Impact Assessment describes and evaluates the current nature conservation interests of the application site, assesses the predicted effects of the proposed development and outlines mitigation measures incorporated in the development design to minimise the impacts of the proposed development on the environment. The application site is not located within any designated sites of ecological importance.

10.1.1 Legislative Context

This report is formulated in the context of the Wildlife Act, 1976 (S.I. No. 39 of 1976), The Wildlife (Amendment) Act, 2000 (S.I. No. 71 of 2001), the EC Council Directive on the Conservation of Natural Habitats of Wild Fauna and Flora 92/43/EEC normally referred to as the Habitats Directive and the subsequent transposition of this directive into Irish law – The European Communities (Natural Habitats) Regulations (S.I. No. 94 of 1997), the European Communities (Natural Habitats) (Amendment) Regulations, 1998 (S.I. No. 233/1998), the Wildlife (Amendment) Bill, 1999 (S.I. No. 38 of 1999) and the European Communities (Natural Habitats) (Amendment) Regulations 2005 (S.I. No. 378 of 2005). Other relevant Directives include the Council Directive 79/409/EC on the conservation of wild birds, known as the Birds Directive which is implemented under the Wildlife Acts. This study also considers IUCN Red listed species and the Irish Red Data Book 1: Vascular Plants (Curtis & McGough, 1988) and the Irish Red Data Book 2: Vertebrates (Whilde, 1993).

Most bird species are protected under the Wildlife Act (1976), except those regarded as pest species and those considered as game species (where they may be hunted under specified conditions). It is an offence to interfere with the breeding place of protected species, though there are exemptions for developments, such as road construction and building works. For the generally common species, best practice provision is made to limit season of removal of vegetation and nesting habitat during the breeding season.

A number of mammalian species, including bats, otters, Irish hares, pine martens and badgers, are protected under the Wildlife Act (1976 and Amendment 2000) and it is an offence to wilfully interfere with or destroy the breeding or resting place of these species, though there are exemptions. In addition many mammals and their habitats have legal protection under Annex IV of the EU Habitats Directive. Otters and certain bat species including the lesser horseshoe bat which is found in Ireland are afforded additional protection under the Habitats Directive as they are covered in Annex II of the legislation.

Ireland has also ratified the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982) and The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983). These conventions were instigated in order to protect migratory species across all European countries, regardless of borders.

10.2 METHODOLOGY

The study methodology comprised consultation with relevant authorities, a desk study and field surveys. The desk study encompassed a wider area up to 10km from the site boundary while the field survey included the site and up to approximately 0.5km outside the site boundary. The baseline ecological conditions are described, including the nature conservation status of the habitats and species present. The results of the survey were used to inform the assessment of potential impacts on ecology and nature conservation interests. Consequently, appropriate mitigation measures are outlined which avoid, minimise or compensate for the potential negative effects identified.

10.2.1 Consultation

A review of the National Parks and Wildlife Service (NPWS), database (www.npws.ie) was carried out to identify designated sites in the area. The Department of the Environment, Heritage and Local Government was consulted with respect to the proposed development and its potential impact on River Boyne and River Blackwater cSAC. The desk study also involved consultation with relevant statutory and non-statutory bodies including:

- Department of the Environment, Heritage and Local Government
- Shannon Regional Fisheries Board
- Central Fisheries Board
- BirdWatch Ireland,
- Irish Peatland Conservation Council
- Bat Conservation Ireland
- Irish Grey Partridge Association
- Irish Wildlife Trust
- Coillte Teoranta
- Fáilte Ireland

To date, responses have been received from the Applications Unit of the Department of the Environment, Heritage and Local Government, Shannon Regional Fisheries Board, Fáilte Ireland and Coillte Teoranta. These responses to relevant bodies consulted are discussed below in Section 10.2.2.1 and written responses in full are contained in Appendix 1.4.

As part of the EIS scoping process the need for an Article 6 Appropriate Assessment as per the Habitats Directive (1992) was communicated by the National Parks and Wildlife Service. This has been completed and can be found in Appendix 10.1.

10.2.2 Desk Study

A desk study was carried out as part of the habitat survey which involved the following elements:

- A review of relevant Ordnance Survey maps,
- A review of relevant literature and reports,
- A review of the National Parks and Wildlife Service database, files and maps of existing designations of nature conservation interest,
- A review of the Environmental Protection Agency website
- Review of Irish Red Data Books and Lists Curtis & McGough (1988) and Whilde (1993)

10.2.3 Field Surveys

10.2.3.1 Flora Survey

A habitat and fauna survey field survey was carried out on 2nd March 2009 by WYG. The weather during the site visit was overcast with light showers.

Habitats present were classified according to Fossitt (2000) and in accordance with the *Draft Habitat Survey Guidelines: a Standard Methodology for Habitat Survey and Mapping in Ireland* (Heritage Council, 2005). Habitats were mapped with Target Notes to describe features of interest. A detailed habitat map is presented in Figure 10.1. Nomenclature follows Webb *et al.,* (1996). Identification keys included Rose (1989) and Rose (2006).

10.2.3.2 Fauna Survey

A survey for vertebrate fauna was also carried out by WYG by means of a search within the site and the immediate locality on the same day as the habitat survey. Species observed during the survey were recorded and an assessment of the faunal interest of the site is included with probable species of conservation interest likely to be using the site.

10.2.3.3 Breeding Bird Survey

Two breeding bird surveys were conducted. These commenced in early morning at the proposed site on 3rd June and 22nd June 2009 by Dr. Fintan Bracken MIEEM. The point count method (Bibby *et al.*, 2000) was used to survey birds at Lumcloon with three sampling points located at least 140 metres apart spread positioned around the proposed site. In addition to the point counts all additional species seen or heard while walking between the sampling points or before or after the point counts were recorded. More details of the bird survey can be found in Appendix 10.2 – Bird Study Report.

<u>Survey Limitations</u>

The site walkover was conducted outside the botanic growing season, generally considered to be May to September (NRA, 2006). Flora recorded from the site may not provide a full representation of species, due to additional species optimum flowering period being earlier in the year. Despite this, the habitat mapping of the site is considered to be accurate given the identification of the species present, the habitats encountered and abiotic features recorded on site.

<u>Ecological Conservation Evaluation</u>

The habitats and fauna within the site were evaluated in terms of their conservation value and assigned an evaluation rating based on the criteria outlined below in Table 10.1 in accordance with standard guidelines (NRA, 2006).

Table 10.1 Site Conservation Evaluation: Rating Qualifying Criteria

Rating	Qualifying Criteria
A	Internationally Important Sites designated (or qualifying for designation) as an SAC* or SPA* under the EU Habitats or Birds Directives. Undesignated sites containing good examples of Annex I priority habitats under the EU Habitats Directive. Major salmon river fisheries. Major Salmonid (salmon, trout or char) lake fisheries.
B	Nationally Important Sites or waters designated or proposed as an NHA*or Statutory Nature Reserve. Undesignated sites containing good examples of Annex I habitats (under EU Habitats Directive). Undesignated sites containing significant numbers of resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive or species protected under the Wildlife (Amendment) Act 2000. Major trout river fisheries. Water bodies with major amenity fishery value. Commercially important coarse fisheries.
C	High Value, Locally Important Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or significant populations of locally rare species. Sites containing any resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive. Large water bodies with some coarse fisheries.
D	Moderate Value, Locally Important Sites containing some semi-natural habitat or locally important for wildlife. Small water-bodies with some coarse fisheries value or some potential salmonid habitat. Any water body with unpolluted water (Q-value 4-5).
E	Low Value, Locally Important Artificial or highly modified habitats with low species diversity and low wildlife value. Water bodies with no current fisheries and no significant potential fisheries value.

(After Natura Site Evaluation Scheme, NRA, 2006).

SAC = Special Area of Conservation; SPA = Special Protection Area; NHA = Natural Heritage Area.

10.3 RECEIVING ENVIRONMENT

10.3.1 Conservation Status of Site

The application site itself is not contained within any EU of Irish designated sites of ecological interest. Several other designated areas occur within 10km of the site. The designated areas are listed and described in Table 10.2 and their locations relative to the application site presented in Figure 10.2.

Table 10.2 Nature Conservation Designations

Site	Designation	Site Code	Description	Distance from Site	Direction
Lough Boora	NHA	001365	This drained lake, surrounded by cutaway bog. Lough Boora is of interest botanically due to the mixture of fen and bog species on the former peatland lake-bed.	c. 2.5 km	South east
Lough Coura	NHA	000909	Lough Coura is a small in-filled lake that has evolved from lake to dry fen	c. 7 km	South west
Royal Canal	NHA	002103	The Royal Canal is anthropogenic habitat that is protected due to its heritage value and the diversity of species it supports along its linear habitats.	c. 1.5 km	North
Ferbane Bog	NHA SAC	000575	Ferbane raised bog is a priority Annex I Habitat under the EU Habitats Directive	c. 6 km	North west
Moyclare Bog	NHA SAC	000581	Moyclare Bog is an active raised bog with a largely intact, relatively wet dome	c. 7 km	North west

*(Source: NPWS website, June 2009)

10.3.2 Consultation Responses

As noted above, consultation responses were received from the Applications Unit of the Department of the Environment, Heritage and Local Government, Shannon Regional Fisheries Board, Fáilte Ireland and Coillte Teoranta.

The National Parks and Wildlife Service of the Department of the Environment, Heritage and Local Government noted that the Silver River adjoins the proposed development site and recommend that the developers ensure that there is no adverse effect to water quality. The surrounding area is Bord na Mona cutaway bog which is important for breeding birds such as hen harrier, whooper swans, grey partridge, wintering waders and wildfowl. They also note the new power plant and that the effect of power lines should also be assessed.

Verbal consultation with the Shannon Regional Fisheries Board was undertaken on the in April and July 2009 where it was highlighted that the Fisheries main concerns related to the effect of abstraction of groundwater during summer months (low flow) and the effect of temperature of wastewater discharges on the Silver River. Both these queries are dealt with in Chapter 8 Groundwater and Chapter 9 Hydrology. The results of the assessments show no significant impact on low flow or water temperature.

Fáilte Ireland note that Lough Boora Parklands is a tourist amenity site used for angling, walking and cycling and hosts a range of wetland habitats and fauna. They therefore recommend that all potential impacts on the environmental and amenity values of the site should be considered as part of the planning process.

Coillte Teoranta noted that their only concern was emissions, in particular the use of sulphuric acid and defoliation of forest crops through acid rain. This is discussed under Air Quality in Chapter 11.

10.3.3 Flora

The Habitat Survey findings are illustrated in an indicative habitat map, which can be found in Figure 10.1. The layout of the proposed development has been overlaid with the habitat map in Figure 10.3. Habitats identified within the site boundary are as follows:

- Hedgerow (WL1)
- Treeline (WL2)
- Conifer plantation (WD4)
- Recolonising bare ground (ED3)
- Dry meadow and grassy verges (GS2)
- Wet grassland (GS4)
- Earth bank (BL2)
- Buildings and artificial surfaces (BL3)
- Drainage ditches (FW4)

10.3.3.1 Hedgerow

Two hedgerows are present within the site, the internal hedgerow along the site entrance appears to be planted originally for aesthetic purposes with a mix of ornamental species compared to the functional hedgerow on the west of the site forming the site boundary. The internal hedgerow is unmanaged with brambles *Rubus fruticosus* agg., cleavers *Galium aparine*, plantain, hard rush *Juncus inflexus,* dandelion *Taraxacum officinale agg,* ragwort *Senecio jacobaea,* present in addition to hedging species such as escallonia sp., cotoneaster *Cotoneaster* sp., variegated laurel *Prunus* sp., Leylandii *Cupressocyparis leylandii* and willow *Salix* spp. The hedgerow forming a portion of the western site boundary comprises a mix of hawthorn *Crataegus monogyna*, ash *Fraxinus excelsior* and gorse *Ulex europaeus*.

Ecological Evaluation

The hedgerow provides important resources for fauna and flora. A small proportion of the hedgerow maybe lost to the proposed development at the site entrance. The hedgerow is considered to be of **moderate** importance at a **local** level and its conservation rating is evaluated as D.

10.3.3.2 Treeline

The northern and western site boundary is delineated by treelines along the roadside. Immature beech *Fagus sylvatica* approximately 6-7m in height has been planted as part of the treeline however the mature species are dominated by elder *Sambucus nigra*, alder *Alnus glutinosa,* ash, blackthorn *Prunus spinosa* with ivy *Hedera helix* and brambles also present. A security fence comprised of concrete posts and wire fencing is present within the treeline along the site boundary. Mature ash and alder trees are present along the north western site boundary.

Ecological Evaluation

The treelines surrounding two sides of the perimeter of the application site are important linear corridors within the surrounding landscape, providing important resources for flora and fauna. The treelines are evaluated as being of **moderate** importance at a **local** level and its conservation rating is evaluated as D.

10.3.3.3 Conifer plantation

A small patch of mature conifer plantation approximately 75m^2 is located at the north western corner of the site. Scots pine *Pinus sylvestris* is the dominant species with Sitka spruce *Picea sitchensis* and leylandii also present along the woodland edge. The understorey of the woodland patch is dominated by elder, with ivy dominating the ground flora. Large areas of the terrain were bare with evidence of ongoing disturbance by mammal species.

10.3.3.4 Ecological Evaluation

Such woodland types are artificial in origin and common in Ireland however this woodland habitat provides important resources for mammals including badgers. This patch of woodland is therefore important on a local level and rated as D.

10.3.3.5 Recolonising bare ground

The majority of the site is under recolonisation since the decommissioning of the former power plant on the site. Concrete slabs are still evident in areas with tarmac and other artificial surfaces. Recolonisation of these surfaces is developed more in some areas than other however due to the history of the site it is mapped as one. The areas to the north of the site undergo a higher level of disturbance than to the south, evident by the varying stages in recolonisation of the area. Grasses and bryophytes dominate the recolonisation process with trees and rushes also present. Nettles *Urtica dioica*, Yorkshire fog *Holcus lanatus*, cocksfoot *Dactylis glomerata*, plantain *Plantago lanceolata*, hard rush, false oat grass *Arrhenatherum elatius*, mouse-ear *Cerastium* sp., clover *Trifolium* sp. and meadow buttercup *Ranunculus acris* are a selection of species recolonising the area. Damper patches within this area are evident by the presence of rushes and pooling of rainfall in areas of remaining hard standing. Two patches of young birch *Betula* spp. trees are present, one at the northern end of the site with ornamental cherry trees *Prunus* sp. shown in Figure 10.1 as Target Note 6 with the other at the centre of the site.

<u>Ecological Evaluation</u>

This habitat is of local importance and is normally of low ecological value, however, due to some patches recolonising more successfully than others with potential to provide important resources for invertebrates, it is rated as D.

10.3.3.6 Dry meadows and grassy verges

Unmanaged areas of grassland surrounding the woodland patch to the north and south are dominated by grass species including Yorkshire fog, meadow foxtail *Alopecurus pratensis*, meadow grass *Poa* spp., bentgrass *Agrostis* sp., cocksfoot, fescue *Festuca* sp., timothy *Phleum pratense*, sedges *Carex* spp., brambles, nettles, and small patches of rubble. Three large electricity pylons are located here as shown in Target Note 3, Figure 10.1.

<u>Ecological Evaluation</u>

This habitat is diminishing throughout Ireland owing to intensive agricultural practices. This is a species rich habitat of moderate conservation value on a local level and evaluated as D.

10.3.3.7 Wet grassland

The grassland patch to the east of the site contains species typical of wet grassland including hard and soft rush *J. effusus*. Other species present include creeping buttercup *R. repens*, carex species, red clover *Trifolium pratense,* false oat grass, fescue and thistles *Cirsium* sp.

<u>Ecological Evaluation</u>

This habitat is diminishing throughout Ireland owing to intensive agricultural and land drainage. This habitat is of moderate conservation value on a local level. Its conservation rating is evaluated as D.

10.3.3.8 Earth bank

An earth bank approximately 2m in height and 2-3m wide is located at the north eastern corner of the site parallel to the drainage ditch before it turns southwards along the site boundary for approximately 30m. The earth bank is vegetated with grassland species such as cocksfoot, Yorkshire fog and nettles.

<u>Ecological Evaluation</u>

The earth bank is artificial in origin and of moderate ecological value on a site level due to its covering with vegetation. It however would not likely be used by mammal species as a cover due to its exposure and lack of cover and is therefore rated as D.

10.3.3.9 Buildings and artificial surfaces

No buildings are present within the site boundary. Remnants of buildings and usage of the site previously in the form of wall gate posts, tarmac surfacing and road kerbs, concrete slabs are however present throughout the site.

<u>Ecological Evaluation</u>

The remaining hard standing within the site is of low conservation value and evaluated as E.

10.3.3.10 Drainage ditches

A drainage ditch flanks the northern site boundary and flows in an easterly direction towards the Silver River. The ditch contains fools water-crest *Apium* spp. and duckweed *Lemna* spp. and at its widest location is approximately 2-3m wide.

Ecological Evaluation

The drainage ditch is common within the local area yet provides important habitat for amphibians such as the common frog and freshwater invertebrates. It is therefore evaluated as D.

10.3.3.11 Habitats Surrounding the Site

The site was originally part of a larger site as such the area to the south of the study site has also been decommissioned resulting in areas of exposed soil and bare ground (ED2) with heaps of rubble and consolidated material around the area as marked as Target Notes 5 on Figure 10.1. A conifer plantation is located to the south east with an area of managed grassland to the east bordering the Silver River which runs in a north south direction less than 50m from the north eastern corner of the site boundary.

Water quality data from the EPA notes that in 2002 and 2005 the Q-value at Lumcloon Bridge was 4, of good status. Water quality data approximately 6km upstream also shows good status in 2005. Stream Risk Assessments were developed by the EPA to determine the risk of streams failing to meet "Good Status" under the water Framework directive (WFD) based on the macroinvertebrate ecology. The Silver River and the Brosna River are both "at risk of not achieving Good Status" (EPA, 2005). The main tributaries of the Silver River are classified as "possibly at risk of not achieving Good Status" (EPA, 2005).

Agricultural land is located to the north and west on the opposite sides of roadways delineating the north and western boundaries of the site. A derelict house is located less than 50m to the north western corner of the site.

10.3.4 Fauna

The potential of the application site to provide habitat for various species of fauna was assessed and any evidence of faunal activity was recorded during the survey. With the exception of the breeding bird survey, no other protected species surveys were carried out for the purposes of this report. The potential of the application site to support any one species is based on the existence of habitat appropriate for that animal. It is important to note that the terms "moderate" or "high" do not refer to the *likelihood* of animals being present, but merely to the *capacity* of that habitat, in its own right and in the absence of other factors to support such animals.

10.3.4.1 Avian Fauna

Twenty-five bird species were recorded during the site visits and these are listed in Table 2 of Appendix 10.2 – Bird Study Report. The species present at the site were typical of farmland and coniferous woodland. The most abundant species were meadow pipit *Anthus pratensis*, swallow *Hirundo rustica*, coal tit *Periparus ater*, wren *Troglodytes troglodytes*, woodpigeon *Columba palumbus* and robin *Erithacus rubecula*. Pheasant may be breeding at the site as during the first visit a female pheasant *Phasianus colchicus* and seven to ten fledglings were flushed from tall grass in the northeast corner of the site. During the first visit one lapwing was recorded at the site and during the survey this bird flew over the site several times and landed in the centre of the site where it appeared to forage for food. No lapwings were recorded during the second visit and it is very unlikely that lapwing are breeding at the Lumcloon site and there was no evidence of any breeding found during the site visits. Lapwing *Vanellus vanellus* is the only species recorded during the survey that is on the current red list of species of conservation concern in Ireland (Lynas, Newton & Robinson, 2007). Three other species (swallow, house martin *Delichon urbicum* and starling *Sturnus vulgaris*) recorded at the site are of medium conservation concern and are on the amber list of species (Lynas, Newton & Robinson, 2007). Further details of the birds recorded during the breeding bird surveys can be found in Appendix 10.2 – Bird Study Report.

10.3.4.2 Mammals

As a result of the habitats present, the application site is likely to support a range of mammal species. The species most likely to be supported on the site include bats, badgers *Meles meles*, pine martens Martes martes, foxes *Vulpes vulpes*, hares *Lepus timidus hibernicus*, rabbits *Oryctolagus cunniculus* and other small mammal species such as wood mouse *Apodemus sylvaticus*. The application site contains habitat which is suitable for foraging badgers and also contains areas of woodland to the north west of the site which are suitable for badgers to build their setts. Mammal pathways were noted during the habitat field survey at two locations shown in Figure 10.1 as Target Note 1 and 2 and snuffle holes were found within the conifer plantation at various locations. It appeared that the conifer plantation provided cover for commuting badgers through the landscape. No sett was identified onsite however the potential of the application site to host badgers is considered to be **moderate** to **high**.

Evidence of the presence of hares within 100m of the site was identified by the occurrence of droppings, the location of which is illustrated as Target Note 4 in Figure 10.1. The potential of the application site to host a range of mammal species, other than badgers and Irish hares is considered to be **high**.

The application site also has potential to support a number of bat species. The dwelling house and sheds to the northwest of the site, the shed to the east of the site and mature trees surrounding the site all provide potential shelter for a range roosting bat species. The dwelling house is stone built and has numerous gaps and cracks in the exterior walls which are suitable places for roosting bats. Connectivity both within the site and surrounding environment is good as vegetation, including treelines, hedgerows and woodland patches provide corridors through the landscape for foraging and commuting. The potential of the application site to provide habitat for bats is **moderate** to **high**.

Otters occur close to major water bodies such as the Silver River. No signs were recorded for otters *Lutra lutra* along the Silver River or drainage ditch within the site however potential does exists for their use of the Silver River. The NPWS database has recordings of otters within 10km of the site (see Appendix 10.3) however within the 10km square of the study site no recording for otter area noted, therefore potential for the use of the area by otters can be regarded as **low to moderate**.

10.3.4.3 Reptiles and Amphibians

The common frog *Rana temporaria* and smooth newt *Triturus vulgaris* are the only two species of amphibians native to Ireland and are protected under the Irish Wildlife Acts (1976 and 2000). The application site has potential to provide ideal habitat for amphibians in the form of drainage ditches and isolated temporary pools formed by remnant hard standing and therefore is of **moderate** value to amphibians.

The viviparous lizard *Lacerta vivipara* is also protected under the Irish Wildlife Acts (1976 and 2000). It can be found in a variety of habitats including wood margins, hedgerows, scrub, grassland and embankments, preferring open, sunny areas. The application site provides a mix of these habitats and is therefore likely to support the viviparous lizard. Thus the application site's suitability to host viviparous lizard is **moderate**.

10.3.4.4 Invertebrates

The mix of habitats provides ideal habitat for a variety of invertebrates, which would in turn provide a valuable food source for foraging bats, birds, amphibians and reptiles. As a result of the survey period and unsuitable weather conditions at the time of the survey few invertebrate species were noted. The drainage ditch within the site has a slow flow yet would be suitable for a range of freshwater invertebrates. The suitability of the site to provide habitat for invertebrates is slightly reduced as a result of the remnant artificial surfaces however the application site's suitability to host a variety of invertebrates is regarded as **moderate**.

Ecological Evaluation

It is assumed that a range of protected species may roost/den, commute and forage within the application site examples of which, such as bats and otters, are of **international** importance. Badgers were noted to be foraging and commuting within the site and as a result of their protected status in Ireland any badgers using the site would be of **national** value. Several woodland and grassland bird species are breeding on the application site including meadow pipit, wren, coal tit and robin and their populations are of **local** value.

Nature Conservation Evaluation

The nature conservation value of the application site was assessed using the Ratcliffe (1977) criteria for site evaluation. The four primary criteria include extent, diversity, naturalness and rarity (EHS, 1999). This is currently accepted as being the most effective method of assessing the nature conservation value of the application site.

Extent – A habitat's importance for nature conservation generally increases with its size. The application site is relatively small, covering an area of 11 acres. The application site is dominated by recolonising bare ground but areas of woodland and grassland occur within the site. The application site has the potential to support a moderate variety of flora and fauna.
Diversity – Variety is better than uniformity, species or habitat richness is generally better than a poor species or habitat complement. The application site is dominated by recolonising bare ground, grassland and woodland which has the potential to provide foraging habitat for a variety of fauna. Several linear features are present on the application site and have the potential to form important foraging and commuting routes for bats.
Naturalness – Sites, which have remained relatively unaltered by man, tend to be the most valuable. Further the sites which are considered most natural are generally those which are hardest to recreate The site cannot be considered as natural as it is a brown field site recently disturbed in the past evident by recolonisation of the remaining artificial surfaces by vegetation.

Rarity – A site where rare or protected species or habitats exist is considered of higher value. Evidence of mammal activity was found onsite and the application site has potential to provide habitat for foraging, commuting and roosting bats. The habitats onsite are not rare within the surrounding landscape.
Fragility – A habitat that is fragile is one that is sensitive to changing influences. Habitats which are liable to such influences are likely to be of higher value than those which are not. The conifer woodland, treelines and hedgerows are vulnerable to cutting and root compaction from building work. In addition the linear features are vulnerable to disruption and interruption which would reduce the value of such features for commuting and foraging bats.
Typicalness – Those habitats which are representative or typical of good examples of their type are considered of higher value than those which are not. The habitats onsite are typical of those in the surrounding countryside. The previous use of the site has resulted in a reduced range of semi-natural habitats evident by the recolonising habitat which is of low conservation value.

10.3.5 Baseline Assessment Summary

Generally the habitats and species present on the application site are of **moderate** importance to wildlife. The habitats have been disturbed by activities in the past including forestry plantation and commercial energy production however since the cessation of activity onsite, the site is undergoing natural recolonisation by both flora and fauna.

10.4 IMPACT ASSESSMENT

The assessment identifies sites, habitats, species and other ecological features that are of national, regional or local ecological value. Key areas and/or species of ecological value within the application site of the proposed development are identified. The main factors contributing to their current ecological value are described. The methodology for evaluation of the nature conservation value (sensitivity) of ecological receptors (habitats and species) affected by the proposed development is adapted from the current Institute of Ecology & Environmental Management (IEEM) guidelines (IEEM 2006). A summary of the guidelines and scales used in this assessment can be found in Appendix 10.4. This section summarises the assessment of the construction and operation impacts on the habitat and fauna.

10.4.1 Construction Phase

10.4.1.1 Habitats

The magnitude of construction impacts on the habitats are considered to be negative and of negligible significance at local level for the majority of habitats on site. The magnitude of construction impacts on the Silver River are considered to be negative, and of minor to negligible significance at local level.

The construction of the proposed development, including the buildings, hard landscaping and associated infrastructure will result in the direct loss of a patch of conifer plantation, wet grassland and proportion of recolonising bareground. These habitats are described above as being of moderate value at a local scale. Potential exists for small proportions of hedgerows, young scattered trees and dry meadows and grassy verges to be lost however the impact to the overall site and surrounding area is expected to be minimal due to the quality of habitat and disturbed nature of these habitats caused by the industrial use of the site in the past. The loss of conifer plantation on the application site is unlikely to lead to fragmentation of the existing linear features of the site if appropriate mitigation is implemented including the retention of the treelines onsite.

This loss of habitat is **permanent**, **negative** and of **negligible** significance at **local** level for the majority of habitats. The conifer plantation permanently lost to the proposed new building development will be of **moderate** significance at **site** level. However this level of impact has been reduced to **minor** at a **local** level due to the existence of conifer plantation within 100m south east of the site and the continuation of the treeline and hedgerow surrounding the site. The loss of wet grassland habitat will be of **minor to negligible** significance at a **local** level due to the small patch size and the presence of grassland in the surrounding landscape. The construction of the proposed development will mostly be on brown field land which is of lower quality to the surrounding habitats.

Where habitats or features are to be retained in the final development suitable mitigation measures (as listed in Section 10.4) have been put in place to protect these habitats during construction. Without appropriate mitigation these features would be subject to indirect impacts associated with construction activities including accidental damage, root compaction, storage of materials, pollution which could lower the value of these habitats as permanent and temporary habitat. Dust and sediment deposition on both aquatic and terrestrial flora affects photosynthetic rates, affecting productivity and growth. The use of artificial light and the increase in noise during construction can reduce the attractiveness of the habitat for wildlife and this could impact on bats which potentially roost in the mature trees and surrounding habitats.

The Silver River is located to the east of the site. Run-off from the site, during the construction and operation phase without appropriate mitigation may contain pollutants, such as silt, which could increase sediment loading potentially affecting organisms within the river system and further downstream. These impacts can be negated and re-evaluated as an imperceptible negative impact on the basis that the construction mitigation measures as outlined in chapter 9.7 are carried out.

10.4.1.2 Fauna

Bats

The mature trees in both the woodland and treelines have potential to provide roosting, commuting and foraging habitat for bats. The loss of these habitats would have a direct, negative impact on the bat population in the area however as the treelines will remain, the impact will be significantly reduced and bats will be able to continue to use these habitats for commuting, foraging and potentially for roosting. Other factors associated with the construction process may also have an indirect impact on bats, in particular the use of artificial lighting. Lighting will lower the value of some of the retained areas of the site to bats, potentially creating barriers along vegetated corridors to commuting bats and possibly encouraging more common species to feed on the invertebrates attracted by the lights at the expense of the rarer bat species. As a result of the conservation and protection status of bats the impact is of **minor** significance at **international** level.

Badgers and other mammal species

Evidence of badger activity within the conifer plantation in the form of snuffle holes and commuting corridors was identified onsite. The loss of this habitat will reduce the foraging habitat for badgers resulting in a **negative** indirect impact of **moderate** significance at a **site** level. Construction noise may cause fauna to avoid the area although this is expected to only be temporary with the return of fauna post construction. Lighting will lower the value of some of the retained areas of the site, for badgers and other mammals, potentially creating barriers to dispersal. Elevated noise levels may temporarily deter badgers and other mammals from using established corridor routes. In addition, any mammals which pass through the site at night risk injury from unattended machinery and open trenches. The impact is of **minor to moderate** significance at **site** level.

Breeding birds

The loss of the small coniferous plantation and other trees would result in a direct **minor negative** impact on the bird community of the **site** as breeding and foraging habitat would be lost.

The proposed development will remove all of the grassland areas from the site and this will result in the loss of breeding habitat for species such as meadow pipit and pheasant and foraging habitat for several species. The only red-listed species found at the site was lapwing but this species was not believed to be breeding on the site but seems to occasionally use the site for foraging. The amber listed starling may also use the grassland habitats on site for foraging. The loss of grassland habitat would also result in a direct minor negative impact on the bird community of the site.

The other amber listed species to occur on the site, swallow and house martin, would not be negatively impacted by the proposed scheme and would continue to forage for flying insects over the development site and the boundary hedgerows.

The areas surrounding the proposed site contains suitable woodland, hedgerow and grassland habitats which could provide alternative breeding and feeding habitats for birds displaced from the proposed site due to the development.

Reptiles and Amphibians

The loss of potential habitat for reptiles will result in a **negative impact** and of **negligible** significance, at **site** level as the site is surrounded by similar habitat in the wider countryside.

Invertebrates and Fish

The drainage ditch will remain onsite therefore there will be no direct loss of habitat. This habitat is of low value to freshwater invertebrates and fish.

10.4.2 Operational Phase

10.4.2.1 Habitats

The impact of operational activities on these habitats is **negative** and of **minor** significance, at **site** level for all retained habitats.

Surface water run-off and waste water from the power plant will be directed to a waste water treatment works prior to discharge into the Silver River. An Assimilative Capacity Study was undertaken as part of the hydrology study (see Section 9.2.5) considering the highest potential discharge rate of 250m^3/day. A slight increase in background Ortho-phosphate concentration from the proposed development is predicted to result in a negligible impact on the water quality in the river. The predicted Ammonia, pH, temperature, suspended solids and BOD5 concentrations in the Silver River are within the permitted level set by the European Communities (Quality of Salmonid Waters) Regulations 1988 (S.I. 293/1988) therefore the impact on the Silver River water quality is perceived as negligible.

Owing to the fact that the footprint of the proposed development is contained within the site, the surrounding treelines will remain onsite and continue to act as a wildlife corridor for faunal species around the site. Management of the habitats which remain on site, such as mowing parcels of grassland and pruning bushes and trees, could also potentially affect the value of these retained habitats and landscaped areas to wildlife. However, good practice guidelines such as avoiding the bird breeding season, reduced use of pesticides and herbicides and delaying grass cutting to allow flowers to set seed will help to reduce these effects.

10.4.2.2 Fauna

The main threats to fauna include the use of artificial lighting onsite and increased noise levels from site activities which may alter the suitability of the site to foraging and commuting fauna. The use of artificial lighting will also alter the distribution of invertebrates within the site and around the site edges and impact on the value of the site as foraging habitat, mainly for bat species.

Bats

If appropriate mitigation is implemented during the construction period then the day to day operation of the final development should not impact negatively on any bats which choose to roost there or nearby. Increased use of artificial lighting and noise within the proposed development may however reduce bat activity in the area, disrupting flight paths and foraging areas. Implementing the appropriate mitigation measures will result in **minor** to **negligible** impacts to bats in the area.

Badgers

The use of artificial light and noise may act as a barrier to movement across or around the site however this is expected to only be temporary with badgers expected to use the area once they have become accustomed to the noise. The implementation of appropriate mitigation will result in **minor negative** impacts to badgers in the area.

Breeding birds

During the operational phase of the development, increased noise from the plant and site traffic may have a temporary **minor negative** impact on birds nesting and foraging in the hedgerows surrounding the site but as these hedgerows are located close to a busy road these birds have already become habituated to a noisy environment.

Reptiles and Amphibians

Levels of disturbance in the form of noise, emissions, general human presence and activity will increase as a result of the operation of the proposed development. This will impact on amphibian habitat onsite. The alteration in drainage ditch flows may cause frog spawn to be washed into the Silver River if present during spawning season however it is important to note that no frog spawn was identified onsite during the site survey which was undertaken during the spawning season (generally accepted to run from February to April). Due to ongoing licensed emissions to the drainage ditch it is unlikely that this habitat will be used by common frogs or newts. Potential impacts on the long-term are therefore expected to be **minor to negligible**.

Invertebrates and Fish

Impacts to terrestrial invertebrates during the operation phase is expected to be negligible. The impact on discharges on freshwater invertebrates and fish within the drainage ditch and Silver River is likely to be negligible as outlined in the assimilative capacity study. No change in water temperature or pH is anticipated with water quality not exceeding Integrated Pollution Prevention and Control Licence (IPPC) standards.

The potential impacts arising from the construction and post construction operation of the proposed development are outlined in Table 10.3 and Table 10.4.

Table 10.3 Summary of Potential Impacts – Construction

Feature	Confidence	Duration	Reversibility	Extent & Complexity	Positive/ Negative	Magnitude	Significance
Hedgerow	Probable	Permanent	Reversible	Direct impact through permanent loss of section of hedgerow	Negative	Slight	Minor - Negligible
Treeline	Probable	Temporary	Reversible	Indirect impact through root compaction and mechanical damage	Negative	Slight	Minor - Negligible
Conifer Plantation	Certain	Permanent	Irreversible	Direct impact through loss of conifer woodland patch	Negative	Slight	Minor
Recolonising bare ground	Certain	Permanent	Irreversible	Direct impact through permanent loss of habitat	Negative	Slight	Minor
Dry meadow and grassy verges	Certain	Permanent	Irreversible	Direct impact through permanent of parcels of grassland	Negative	Slight	Minor
Wet grassland	Certain	Temporary	Irreversible	Direct impact through permanent loss of habitat	Negative	Slight	Minor
Earth bank	Probable	Permanent	Irreversible	Reduction in extent of earth bank	Neutral	Negligible	Negligible
Buildings and artificial surfaces	Certain	Permanent	Irreversible	Loss of hardstanding	Negative	Negligible	Negligible
Drainage ditches	Probable Probable	Permanent Temporary	Irreversible Reversible	Alteration of drainage channel. Accidental release of pollutants, silts entering the stream from surface water run-off from the site	Negative Negative	Slight Slight	Minor – Negligible Minor
Silver River	Probable	Permanent	Reversible	Indirect impact on river from accidental release of pollutants, silts entering the drainage ditch from surface water run-off from the site	Negative	Slight	Minor - Negligible
Bats	Certain Probable	Permanent Temporary	Irreversible Reversible	Direct impact through loss of potential foraging and commuting habitat Indirect impact through disturbance from construction (increased noise, light and vibration)	Negative	Slight	Moderate - Minor
Protected mammals (excl bats)	Certain Probable	Permanent Temporary	Irreversible Reversible	Direct impact through loss of potential foraging habitat Indirect impact through construction works (elevated noise, vibration, lighting & disturbance)	Negative	Slight	Moderate - Minor

Feature	Confidence	Duration	Reversibility	Extent & Complexity	Positive/ Negative	Magnitude	Significance
Breeding birds	Certain Probable	Permanent Temporary	Irreversible Reversible	Direct impact through loss of potential foraging and breeding habitat Indirect impact through construction works (elevated noise, vibration, lighting & disturbance)	Negative	Slight	Minor
Reptiles and Amphibians	Certain	Permanent	Irreversible	Direct impact through loss of terrestrial habitats.	Negative	Slight	Moderate – Minor
Invertebrates and fish	Certain Probable	Permanent Temporary	Irreversible Irreversible	Direct impact through loss of terrestrial habitats. Pollutants, silts entering the system from surface water run-off from the site	Negative Negative	Moderate Slight	Moderate – Minor Minor - Negligible

Table 10.4 Summary of Potential Impacts – Operation

Feature	Confidence	Duration	Reversibility	Extent & Complexity	Positive/ Negative	Magnitude	Significance
Hedgerow	Probable	Permanent	Reversible	Landscaping of grassland, potential for increase in species	Positive	Slight	Minor
Treeline	Probable	Permanent	Reversible	Landscaping of grassland, potential for increase in species	Positive	Slight	Minor
Dry meadow and grassy verges	Likely	Permanent	Reversible	Potential for increase in species through appropriate management	Positive	Slight	Minor
Drainage ditches	Probable Unlikely	Permanent Temporary	Irreversible Irreversible	Potential alteration of drainage channel. Pollutants, silts entering the stream from surface water run-off from the site	Negative Negative	Slight Slight	Minor – Negligible Minor - Negligible
Silver River	Unlikely	Permanent	Irreversible	Output from cooling tower will enter Silver River with potential to alter flow rate and chemical composition	Negative	Slight	Minor - Negligible
Bats	Probable	Temporary	Reversible	Indirect impacts from operational activities (elevated noise, pollution, lighting and disturbance) disrupting retained foraging features and commuting corridors	Negative	Slight	Moderate - Minor
Protected mammals (excl bats)	Probable	Temporary	Reversible	Indirect impacts from operational activities (elevated noise, pollution, lighting and disturbance) disrupting retained foraging features and commuting corridors	Negative	Slight	Moderate - Minor
Breeding birds	Probable	Temporary	Reversible	Indirect impacts from operational activities (elevated noise, pollution, lighting and disturbance) disrupting retained foraging & nesting sites	Negative	Slight	Minor
Reptiles and Amphibians	Probable	Temporary (disturbance)	Irreversible	Disturbance to amphibian habitat through discharge into drainage ditch	Negative	Slight	Moderate – Minor
Invertebrates and fish	Probable	Temporary (disturbance)	Irreversible	Alteration of flow rate within drainage channel and Silver River. Alteration of chemical composition, pH, water temperature within freshwater system. Pollutants, silts entering the system from surface water run-off from the site	Negative	Slight	Minor - Negligible

10.5 MITIGATION MEASURES

Mitigation measures have been outlined to minimise the impacts of the proposed development on the environment. Mitigation may include avoidance, replanting, incorporation of less damaging designs or working methods to reduce impacts on the environment and where possible increase the amount or quality of the wildlife habitat on site.

10.5.1 Construction Phase

10.5.1.1 Environmental Management Plan

An Environmental Management Plan will be compiled prior to works commencing to ensure best environmental practice during construction and to control the implementation of the development to avoid and limit damage to flora and fauna during construction both within the construction site and downstream of the site. This will address the indirect impacts as a result of construction activities, such as elevated levels of noise, dust pollution and surface water run-off. It will include, for example, avoiding sensitive stages of species lifecycles, such as the bird breeding season and salmonid species. The plan will provide long-term management & monitoring objectives for the development during operation.

10.5.1.2 Landscaping Strategy

A Landscaping Strategy will be compiled for the application site as there is an opportunity within the development to undertake landscaping that will benefit the wildlife of the local area and compensate for any direct loss of habitat. Landscape design will reflect the local habitat and species already present on the site and the surrounding landscape. The use of exotic species will be avoided. All proposed planting will comprise locally sourced, nursery grown native species characteristic of the local area. Native landscaping increases biodiversity, attracts a greater variety of wildlife and improves the value of the final development to wildlife. The development can contribute, in a positive way, to targets for conserving protected habitats and species for example, by using bat friendly lighting and by including bat boxes and bird boxes were possible.

10.5.1.3 Disturbance to Habitats

- The existing treelines present on site will be retained in the final development. This will retain trees which are native species and those which form linear features around the site.

- Trees will be cordoned off during construction so as not to impinge on the Root Protection Area (RPA) of the trees, as outlined in Trees in Relation to Construction – Recommendations (BS 5837: 2005). The Root Protection Area is the minimum area in m^2 which should be left undisturbed around each retained tree. It is calculated as an area equivalent to a circle with a radius 12 times the stem diameter for single stem trees and 10 times basal diameter for trees with more than one stem arising below 1.5 m above ground level. The equation for the calculation of Root Protection Area for a single stem tree is indicated below:

$$RPA\left(m^2\right)=\left(\frac{stem\,diameter\,(mm)@1.5m\times 12}{1000}\right)^2\times\pi$$

- Where feasible, works, and specifically the removal of vegetation, will be appropriately timed to avoid disturbance of fauna species.
- Where possible areas of grassland within the final development will be reseeded with a native species mix that is representative of the species present within the area and which will provide good habitat for a range of invertebrate species and increase the value of the finished development for wildlife. Species tolerant of mowing should be selected.
- Surface water run-off from the site will enter the drainage ditch and the Silver River. Potential impacts to water quality and indirect impacts on aquatic flora and fauna will be mitigated for using the mitigation measures described in Hydrology Chapter 9. Standard pollution prevention procedures should be implemented during construction and operation to minimise the potential for pollution of surface water and groundwater such as Masters-Williams *et al.* (2001). All instream works should be conducted in close consultation with the Shannon Regional Fisheries Board in the appropriate season and follow industry standard.
- A strip of existing habitat along the drainage ditch bank will be maintained as part of the development as a buffer zone (c10m width). This will maintain the existing wildlife corridor which provides important shelter and movement for many species. The buffer will also minimise direct contamination and will help towards reducing any sediment loading. For instream works, it is recommended that a silt curtain is installed to avoid increased siltation and smothering of habitats downstream.
- Depending upon the design of the buildings it may be possible to incorporate Green roofs on some of the buildings.
- All waste oil, empty oil containers and other hazardous wastes will be disposed of in conjunction with the requirements of the Waste Management Act 1996.
- Mitigation measures will be put in place to reduce the movement of dust associated with the site works to adjacent habitats.

- Refuelling of machinery and mixing of cement should be carried out away from any water course. All efforts will be made to avoid surface runoff and leachate from concrete, as this is a very aggressive material in the aquatic environment.
- Measures to allow appropriate emergency spill responses should be implemented.

10.5.1.4 Disturbance to Fauna

- To prevent injury to wildlife all trenches will be fenced or covered at night.
- If badgers or their setts, otters and their holts or smooth newt or viviparous lizard are found on site work will be stopped immediately and a qualified ecologist will identify appropriate mitigation measures. Badgers are fully protected under the Irish Wildlife Acts and amendments 1976 and 2000.
- Best practice should ensure that site clearance works and construction works likely to cause considerable disturbance to birds would take place outside the bird breeding season, which extends from 1 March until the 31 July. All birds are protected under the Irish Wildlife Acts and amendments 1976 and 2000. Any mature trees, dead trees or trees with cavities, loose bark, splits, cracks or significant cover of climbing plants to be removed should first be inspected for the presence of bats. Bats are fully protected under fully protected under the Irish Wildlife Acts and amendments 1976 and 2000 and the EU Habitats Directive, (1992).
- The use of artificial lighting during the construction phase should be minimised and where its use cannot be avoided lighting should comply with the guidelines set down by the Bat Conservation Trust (2008).
- Care will be taken during the clearance of vegetation to avoid killing or injuring small mammals. These species are particularly vulnerable if they are nocturnal, hibernating or breeding. Breeding seasons vary from species to species. Particular care should be exercised when removing the piles of dead wood and other vegetation which are present throughout the site. These areas are of high value to wildlife and could potentially provide shelter for a variety of small mammal species, such as hedgehogs.

10.5.2 Operational Phase

10.5.2.1 Disturbance to habitats

- No protected flora was recorded from the site therefore no specific mitigation measures are required. However, the following measures are recommended to protect water quality and local biodiversity.

- Silt traps, sedimentation tanks and oil separators / petroleum interceptors will be incorporated in the surface water drainage design to protect the aquatic environment.
- All waste discharges will be treated to IPPC standards.
- Care must be taken to ensure that invasive weeds, such as Japanese knotweed *Fallopia japonica* are not brought onto the site during the construction and operation phases.
- Efforts will be made to manage the remaining habitats on site in a manner which is beneficial to wildlife. For instance insuring that pruning of vegetation is carried out outside the bird breeding season will limit disturbance to nesting birds.

10.5.2.2 Disturbance to Fauna

- Effort should be taken to reduce the use of artificial lighting where possible. Where it is not possible to avoid introducing artificial light, light sources used should comply with the guidelines set down by the Bat Conservation Trust (2008) regarding bats and lighting. This is will also applicable to bird and mammal species.
- Bird boxes / bricks (swift bricks) and bat boxes / bricks will be incorporated into the development where feasible thereby compensating and possibly providing additional roosting opportunities for these species.

10.6 RESIDUAL IMPACT

The potential impacts, suggested mitigation and residual significance of the proposed development are summarized in Table 10.5. No significant residual impacts to ecology are anticipated, if all practicable mitigation measures as stated in Chapter 10.4 are implemented for the proposed development.

The application site is not contained within any EU or Irish designated sites of ecological importance. Through the use of appropriate mitigation and standard good practices both during and post construction, it is considered unlikely that the proposed development will impact on designated sites.

No significant impacts are expected within the site during the construction stage of the proposed development or the operation of the treatment plant once the mitigation measures are implemented. It is likely however that the development will lead to some loss of roosting, commuting and foraging opportunities, for birds, badgers and bats, however this is considered to be minor negative once bird and bat boxes, bricks are incorporated into the development. Other potential impacts of the proposed development stem from loss of habitat including small areas of conifer plantation and wet grassland. Mitigation by replanting and managing the treelines with native species will reduce the impact of the development and may serve to increase the value of the ecological corridors within the site to wildlife.

Operational impacts of the proposed development are limited and can be further reduced by installing bat friendly lighting and producing and implementing a Landscaping Strategy and Ecological Management Plan. Managing the retained habitats within the application site in a manner which is beneficial to wildlife will further reduce the operational impacts of the development. Operation phase of the development will result in regular discharges to the Silver River however the impact once appropriate measures are put in place as part of the proposed development are expected to be **minor to negligible**.

In conclusion, if suitable mitigation is implemented the predicted impact of the proposed development on the application site will be **minor** negative.

Table 10.5 Residual significance of predicted impacts of the proposed development following appropriate mitigation

Description of impact	Impact	Mitigation Measure	Residual Significance
Loss of small proportion of hedgerow	Minor Irreversible Permanent	Compensate by replanting area nearby with native species.	Negligible
Root compaction of trees	Minor Reversible Permanent	Establish root protection zone and exclusion area	Negligible
Loss of conifer plantation during construction	Minor Irreversible Permanent	Replant where possible	Negative Minor
Loss of recolonising bare ground during construction	Minor Irreversible Permanent	None	Negative Minor
Loss of wet grassland during construction	Minor Irreversible Temporary	None	Negative Minor
Loss of dry meadow and grassy verges during construction	Minor Irreversible Permanent	Landscaping works will maintain management of area and increase biodiversity of habitat	Negligible
Drainage ditch	Minor to negligible Irreversible Permanent	Implement sedimentation tanks, oil filters to protect from surface water run-off. Measures to insure water discharge of low temperature, same pH. Creation of buffer zone along drainage ditch	Negative Minor to negligible
Silver River	Minor to negligible Irreversible Permanent	Implement sedimentation tanks, oil filters to protect from surface water run-off. Measures to insure water discharge of low temperature, same pH.	Negative Minor to negligible
Disturbance to foraging and commuting bats during construction and operation	Moderate - Minor Reversible Permanent	Minimize the use of artificial lighting where possible. Use lighting which complies with the recommendations of the Bat Conservation Trust (2008) Retain linear features where possible Install bat boxes	Negative Minor

Description of impact	Impact	Mitigation Measure	Residual Significance
Disturbance to badgers and other mammals during construction and operation	Moderate - Minor Reversible Permanent	Careful removal of woodland, retention of linear features. Cover or fence trenches at night	Negative Minor
Disturbance to breeding birds during construction and operation	Minor Irreversible Permanent	Timing of vegetation clearance to avoid breeding season Protection of retained trees and hedgerow Replant trees and hedgerow Install bird boxes	Negative Minor
Loss of reptiles habitat and disturbance to amphibians habitat	Moderate - Minor Reversible Permanent	Creation of buffer zone along drainage ditch	Negative Minor
Invertebrates	Minor to negligible Reversible Permanent	Implement sedimentation tanks, oil filters to protect from surface water run-off. Measures to insure water discharge of low temperature, same pH.	Negative Minor to negligible

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11.0 AIR QUALITY

11.1 INTRODUCTION

This chapter considers the potential air quality impacts arising from the proposed gas-fired power plant during both the construction and operational phases of the proposed development.

The potential air quality impacts that may arise from the operation of the proposed development include emissions to atmosphere of typical gas-fired combustion emission gases from the stacks. Emissions to atmosphere could also arise from traffic generated by the proposed development.

11.2 METHODOLOGY

WYG employed the following air quality methodology and standards to assess the potential impact on air quality arising from the proposed development.

11.2.1 Ambient Air Quality Standards

The European Commission set down the principles of its approach to ambient air quality standards in 1996 with its Air Quality Framework Directive. This became Irish law through the Environmental Protection Agency Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999 (SI 33 of 1999). Four "daughter" directives lay down limits for specific pollutants. The first two of these directives refer to sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter, lead, carbon monoxide and benzene. These two directives became Irish law as the Air Quality Standards Regulations 2002. Two further daughter directives deal with Ozone (in Irish law as the Ozone in Ambient Air Regulations 2004) and polyaromatic hydrocarbons, arsenic, nickel, cadmium and mercury in ambient air (not yet transposed into Irish law). The new Air Quality Directive (CAFE) Air Quality Clean Air for Europe Directive (2008/50/EC) replaces the air framework directive and the first three daughter directives. This has yet to be transposed into Irish law. Tables 11.1 to 11.6 below, set out the limit values or target values specified by the three published daughter directives.

Table 11.1 Limit Values of Directive 1999/30/EC

Pollutant	Limit Value Objective	Averaging Period	Limit Value µg/m3	Basis of Application of the Limit Value	Limit Value Attainment Date
SO_2	Protection of human health	1 hour	350	Not to be exceeded more than 24 times in a calendar year	1 Jan 2005
	Protection of human health	24 hours	125	Not to be exceeded more than 3 times in a calendar year	1 Jan 2005
	Protection of vegetation	calendar year	20	Annual mean	19 July 2001
	Protection of vegetation	1 Oct to 31 Mar	20	Winter mean	19 July 2001
NO_2	Protection of human health	1 hour	200	Not to be exceeded more than 18 times in a calendar year	1 Jan 2010
	Protection of human health	calendar year	40	Annual mean	1 Jan 2010
NO_x	Protection of ecosystems	calendar year	30	Annual mean	19 July 2001
PM_{10} – Stage 1	Protection of human health	24 hours	50	Not to be exceeded more than 35 times in a calendar year	1 Jan 2005
	Protection of human health	calendar year	40	Annual mean	1 Jan 2005
PM_{10} – Stage 2	Protection of human health	24 hours	50	Not to be exceeded more than 7 times in a calendar year	1 Jan 2010
	Protection of human health	calendar year	20	Annual mean	1 Jan 2010
Lead	Protection of human health	calendar year	0.5	Annual mean	1 Jan 2005

Table 11.2 Alert Thresholds for Sulphur Dioxide & Nitrogen Dioxide

Pollutant	Averaging Period	Limit Value
Sulphur Dioxide	1 hour	500 µg/m^3
Nitrogen Dioxide	1 hour	400 µg/m^3

Note: The public must be informed if the following thresholds are exceeded for three consecutive hours.

Table 11.3 Limit Values of Directive 2000/69/EC

Pollutant	Limit Value Objective	Averaging Period	Limit Value	Limit Value Attainment Date
Carbon Monoxide	Protection of human health	8 hours	10 mg/m3	1 Jan 2005
Benzene	Protection of human health	Calendar year	5 µg/m3	1 Jan 2010

Target Values and Long Term Objectives of Directive 2002/3/EC

The ozone daughter directive is different from the previous two in that it sets target values and long term objectives for ozone levels rather than limit values. They are as follows:

Table 11.4 Target Values for Ozone from 2010

Objective	Parameter	Value
Protection of human health	Maximum daily 8 hour mean	120 ug/m3 not to be exceeded more than 25 days per calendar year averaged over 3 years
Protection of vegetation	AOT40, calculated from 1 hour values from May to July	18000 µg/m3-h averaged over 5 years

Table 11.5 Long Term Objectives for Ozone from 2020

Objective	Parameter	Value
Protection of human health	Maximum daily 8 hour mean	120 µg/m3
Protection of vegetation	AOT40, calculated from 1 hour values from May to July	6000 µg/m3-h

Table 11.6 Information and Alert Thresholds for Ozone

Objective	Parameter	Threshold
Information Threshold	1 hour average	180 µg/m3
Alert Threshold	1 hour average	240 µg/m3

The public must be informed if ozone levels exceed the thresholds

11.2.2 Baseline Assessment Methodology

11.2.2.1 NO_2 & SO_2 Diffusion Tube Baseline Monitoring

Background concentrations of NO_2 and SO_2 were determined using passive diffusion tube monitoring. The diffusion tubes were placed at four monitoring locations in the vicinity of the site. Following completion of the monitoring survey, the passive diffusion tubes were capped and placed in a protective container and sent to the Gradko International Ltd. laboratory for analysis. The sample locations, date and time were recorded for each sample. The results are expressed in $\mu g/m^3$ and compared to relevant annual average limit values.

11.2.2.2 Relevant Background Air Quality Concentration Data

Baseline air quality monitoring data from the EPA monitoring database was analysed. The most recent annual report on air quality in Ireland was published in 2007 and details the range and scope of monitoring carried out throughout Ireland. EPA Air Quality Data was available for Ferbane, Co. Offaly from the 4th October 2006 to 29th March 2007.

As part of the EU Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined for Ireland, as follows;

- Zone A: Dublin Conurbation
- Zone B: Cork Conurbation
- Zone C: Other Cities and Large Towns comprising Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Ennis, Bray, Naas, Carlow, Tralee and Dundalk (Towns with a population above 15,000).
- Zone D: Rural Ireland, i.e. the remainder of the State excluding Zones A, B and C.

The area in the vicinity of the Lumcloon is in Zone D, one of the four air quality zones in Ireland. Zone D consists of small towns and rural areas of the country. The EPA continuous air quality monitoring locations that are representative of Zone D include Mountrath, Drogheda, Castlebar, Glashaboy and Kilkitt. EPA mobile monitoring units also monitor air quality at locations within Zone D.

Air quality data published in the EIS for the proposed power plant at Derrygreenagh, Co. Offaly was also referenced. This site is approximately thirty eight kilometres from the proposed development site at Lumcloon, Co. Offaly.

11.2.3 Dispersion Modelling Methodology

The potential ground level concentrations (GLC) of gaseous pollutants at receptors in the vicinity of the site have been predicted using the *AERMOD* atmospheric dispersion model. The transport and transformation of a pollutant in the atmosphere can be predicted with a degree of confidence using this model. *AERMOD* is a USEPA regulatory model for calculating pollutant concentrations from industrial sources and is widely accepted and used by the EPA. The model contains a meteorological data pre-processor (*AERMET*) and a terrain pre-processor (*AERMAP*) that allows for the influence of meteorological and local terrain data to be incorporated into the dispersion modelling predictions. The model predicts the ground level concentration or deposition value for each pollutant. Since most air quality standards are expressed as averages or percentiles, *AERMOD* allows further analysis of the results for comparison purposes. Percentile analysis for emissions is calculated for the maximum averages using the *AERMOD*-percent post-processing utility. This utility calculates the maximum concentration of a pollutant at all receptors at a specific percentile for a specific period.

The predicted emissions from the processes on site are based on emission data provided by Lumcloon Energy. The results of the dispersion modelling study have been assessed and compared to the relevant air quality standards.

The air dispersion modelling assessment was carried out in accordance with the Royal Meteorological Society statement on atmospheric dispersion modelling: '*Guidelines on the justification of choice and use of models, and the communication and reporting of results*'.

11.2.4 Impact Assessment Significance Criteria

The impact of the proposed development was assessed in accordance with the relevant ambient air quality standards as outlined above. At present, there is no legislative guidance in Ireland for the assessment of relative impact with regard to the increase / decrease in ambient air pollutant concentrations as a fraction of the relevant limit values. Ideally, the air quality impact assessment methodology should provide a description of the "nature of impact", "duration", "magnitude", "sensitivity", "significance" and "level of confidence". In the absence of appropriate guidliens to assess the relative impact, the National Roads Authority document "*Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes*" details a methodology for determining air quality impact significance criteria for road schemes and this has been adopted in this case.

11.2.4.1 Nature of Impact

The significance of environmental effects is determined according to their magnitude and the sensitivity of receptors. Significant impacts may be of the following nature:

- Adverse or beneficial
- Temporary or permanent
- Short or long term
- Direct or indirect
- Reversible or irreversible
- Cumulative

<u>Duration</u>

The following terms are defined when quantifying duration (EPA Guidelines, 2002):

- Temporary: up to 1 year
- Short-term: from 1-7 years
- Medium-term: 7-15 years
- Long-term: 15-60 years
- Permanent; over 60 years

<u>Magnitude</u>

The National Roads Authority document *'Guidelines for the treatment of Air Quality during the Planning and Construction of National Road Schemes'* details a methodology for determining air quality impact significance criteria for road schemes. The magnitude of the impacts due to the scheme, as they affect sensitive locations, may be described using the criteria set out in Table 11.7, i.e. the impact can range from very large to extremely small. These impacts can represent an increase or decrease in exposure to air pollutants.

Table 11.7 Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Magnitude of Change	Annual Mean NO_2/PM_{10}	Days PM10>50µg/m^3
Very Large	Increase/decrease >25%	Increase/decrease >25 days
Large	Increase/decrease 15-25%	Increase/decrease 15-25 days
Moderate	Increase/decrease 10-15%	Increase/decrease 10-15 days
Small	Increase/decrease 5-10%	Increase/decrease 5-10 days
Very Small	Increase/decrease 1-5%	Increase/decrease 1-5 days
Extremely Small	Increase/decrease <1%	Increase/decrease <1 days

Source: Guidelines for the treatment of Air Quality during the Planning and Construction of National Road Schemes – National Roads Authority (2006)

Significance

The interaction of magnitude and sensitivity results in the significance of an environmental effect. Significance should always be qualified as in certain cases an impact of minor significance could be considered to be of great importance by local residents and deserves further consideration. The significance of the impacts needs to take account of the magnitude of the change and the levels in relation to the standards. This may be achieved using the criteria set out in Table 11.8, as quoted form the National Roads Authority document *'Guidelines for the treatment of Air Quality during the Planning and Construction of National Road Schemes'*.

Table 11.8 Air Quality Impact Significance Matrix

Absolute Concentration in relation to Standard Note 1	Change in Concentration					
	Extremely Small	Very Small	Small	Moderate	Large	Very Large
Decrease with Scheme						
Above Standard with Scheme	slight beneficial	slight beneficial	substantial beneficial	Substantial beneficial	very substantial beneficial	very substantial beneficial
Above Standard in Do-min, Below with Scheme	slight beneficial	moderate beneficial	substantial beneficial	Substantial beneficial	very substantial beneficial	very substantial beneficial
Below Standard in Do-min, but not Well Below	negligible	slight beneficial	slight beneficial	moderate beneficial	moderate beneficial	substantial beneficial
Well Below Standard in Do-min	negligible	negligible	slight beneficial	slight beneficial	slight beneficial	moderate beneficial
Increase with Scheme						
Above Standard in Do-min	slight adverse	slight adverse	substantial adverse	substantial adverse	very substantial adverse	very substantial adverse
Below Standard in Do-min, Above with Scheme	slight adverse	moderate adverse	substantial adverse	substantial adverse	very substantial adverse	very substantial adverse
Below Standard with Scheme, but not Well Below	negligible	slight adverse	slight adverse	moderate adverse	moderate adverse	substantial adverse
Well Below Standard with Scheme	negligible	negligible	slight adverse	slight adverse	slight adverse	moderate adverse

Note 1: Well Below Standard = <75% of limit value

Source: Guidelines for the treatment of Air Quality during the Planning and Construction of National Road Schemes – National Roads Authority (2006)

Sensitivity

Sensitivity, or the importance of a receptor, is determined in terms of geographical extent and/or the importance of a receptor based on statutory designations. There are a number of proposed Natural Heritage Areas in the area of the proposed development. Lough Boora pNHA is located approximately 3km to the south east of the site. Grand Canal pNHA is located approximately 3km to the north of the site. Moyclare Bog and Ferbane Bog which are Special Areas of Conservation (SAC) and pNHAs are located approximately 7km to the north east of the proposed development site.

Receptors such as individual properties and small watercourses are generally considered to be of local importance. The sensitivity of a receptor is determined according to the methodology shown Table 11.9.

Table 11.9 WYG Methodology for Determining Sensitivity

Sensitivity	Examples of Receptors
International	Special Area of Conservation, World Heritage Site
National	Site of Special Scientific Interest, Scheduled Ancient Monument, major aquifer used for potable water supply, national air quality resource
Regional or County	County Wildlife Site, Cyprinid fisheries, minor aquifer used for general water supply purposes, Sites and Monuments Record, regional transport network
Local or Borough	Single property or group of properties, ordinary watercourse, unclassified drainage ditch, footpath

11.2.4.2 Level of Confidence

WYG consider it very important to attribute a level of confidence by which the predicted impact has been assessed. For the purpose of this assessment, the criteria for these definitions are set out in Table 11.10.

Table 11.10 Impact Prediction Confidence

Confidence Level	Description
High	The significance of an environmental effect is an informed estimate likely to be based on reliable data or subjective judgement with reference to similar schemes. Further information would not result in any change to assessment of significance.
Low	The significance of an environmental effect is a best estimate likely to be based on subjective judgement without reference to similar schemes. Further information would be needed to confirm assessment of significance.

11.3 RECEIVING ENVIRONMENT

11.3.1 Baseline Air Quality Monitoring Results

11.3.1.1 NO_2 & SO_2 Diffusion Tube Baseline Monitoring Results

Background concentrations of NO_2 and SO_2 were determined using passive diffusion tube monitoring. The diffusion tubes were placed at four monitoring locations labelled AML-1 to AML-4 from 3rd February 2009 to 4th March 2009. Following completion of the monitoring survey, the passive diffusion tubes were capped and placed in a protective container and sent to the Gradko International Ltd. laboratory for analysis. The sample locations, date and time were recorded for each sample. The results are expressed in µg/m^3 and compared to relevant annual average limit values. The results of the baseline monitoring are presented in Table 11.11 and the baseline diffusion tube monitoring locations are illustrated on Figure 11.1.

Table 11.11 Nitrogen dioxide (NO_2) and Sulphur Dioxide (SO_2) Passive Diffusion Tube Sampling Results

Sample Location ID	NO_2 (µg/m^3)	SO_2 (µg/m^3)
AML-101	5.96	0.55
AML-102	5.57	<LOD
AML-103	3.96	<LOD
AML-104	3.87	0.6
Limit Value	**40**	**20 (V)**

Note:
1. <L.O.D. Below limit of detection
2. (V) = for the protection of vegetation.

The passive diffusion tube survey gives an indication of the existing baseline air quality levels at sensitive receptor locations in the vicinity of the proposed power plant. Average nitrogen dioxide levels of 4.84µg/m^3 were recorded over all the monitoring locations. At each location, the nitrogen dioxide and sulphur dioxide levels were well below the annual average EU limit values, i.e. approximately 10% of the limit value. The results confirm that the baseline pollutant concentrations in the area are less than the relevant ambient air quality limit values. These results are not bias corrected as it is only recommended to apply a bias adjustment factor to the annual mean, not to individual monthly values.

11.3.1.2 Relevant PM_{10} Monitoring Results

PM_{10} monitoring was carried out from January to August 2008 for the air quality impact assessment of the proposed power plant at Derrygreenagh, Co. Offaly, which is approximately 38 km from the proposed Lumcloon site. An average value of 18 µg/m^3 was recorded which is less than 50% of the relevant annual mean PM_{10} limit value. This average value of 18µg/m^3 together with the EPA PM_{10} monitoring data for Ferbane, Co. Offaly of 21µg/m^3 suggests that the background PM_{10} concentration in the area is approximately 50% of the relevant annual mean PM_{10} limit value.

11.3.1.3 EPA Air Quality Monitoring Reports

The closest Environmental Protection Agency air monitoring sample points to the proposed development is located at Ferbane mobile monitoring station. This mobile monitoring station was located approximately seven kilometres to the north east of the proposed development site.

Table 11.12 Typical air quality monitoring data representative of EPA Zone D monitoring sites – 2007

Pollutant	Zone D Monitoring Stations	EPA Baseline Monitoring Data Annual Mean 2007	Relevant Limit Value
PM_{10}	Ferbane Navan Drogheda Castlebar Cork Harbour Kilkitt Carnsore Point	21µg/m^3 23µg/m^3 18µg/m^3 14µg/m^3 17µg/m^3 10µg/m^3 27µg/m^3	PM_{10} annual mean limit for the protection of human health = 40µg/m^3
SO_2	Ferbane Kilkitt Navan Shannon Estuary Cork Harbour	5µg/m^3 2µg/m^3 4µg/m^3 3µg/m^3 3µg/m^3	SO_2 annual mean limit for the protection of vegetation= 20µg/m^3
NO_2	Ferbane Navan Glashaboy Kilkitt Cork Harbour	6µg/m^3 16µg/m^3 9µg/m^3 2µg/m^3 11µg/m^3	NO_2 annual mean limit for the protection of human health = 40µg/m^3
NO_x	Ferbane Navan Glashaboy Kilkitt Cork Harbour	8µg/m^3 32µg/m^3 13µg/m^3 3µg/m^3 16µg/m^3	NO_x annual mean limit for the protection of vegetation= 30µg/m^3
Lead	Ferbame Navan Cork Harbour	0.00µg/m^3 0.00µg/m^3 0.00µg/m^3	Pb annual mean limit for the protection of human health = 0.5µg/m^3
Ozone	Emo Court Glashaboy Kilkitt Mace Head Johnstown Castle Velentia	47µg/m^3 50µg/m^3 59µg/m^3 75µg/m^3 56µg/m^3 63µg/m^3	Maximum Ozone daily 8 – hour mean limit = No more than 25 days > 125µg/m^3
Carbon Monoxide	Ferbane Navan Cork Harbour	0.2µg/m^3 0.5µg/m^3 0.2µg/m^3	CO maximum daily 8 – hour mean value = 10 mg/m3
Benzene	Mountrath	Annual mean 2007 n/a Annual Mean 2005 = 0.3µg/m^3	Benzene annual mean limit for the protection of human health = 5µg/m^3

EPA Air Quality Monitoring Data - Ferbane

Air quality monitoring data from the Ferbane, Co. Offaly Air Quality Monitoring Station was reviewed. This data is presented as daily or hourly means recorded throughout the monitoring period. Various percentile values were also calculated. Therefore, the recorded maximum daily and hourly means and the annual hourly mean values over the monitoring period have been averaged to allow for representative background concentrations in the vicinity of the proposed development location. This background air quality monitoring data (4th October 2006 – 29th March 2007) has been used to represent *Ambient Concentration (AC)* in the Air Quality Impact Assessment.

The monitoring station was originally sited at the town sewerage works on the western edge of the town on 4th October 2006 and remained at that location until 31st January 2007. This location was sited approximately 500m from the centre of Ferbane. The monitoring location was subsequently moved to the premises of Offaly County Council at the disused railway station on the southern edge of town on the 31st January 2007, as it was a more representative location of air quality in the town. The council premises are located beside the N62 which passes through Ferbane. Monitoring finished on 29th March 2007. Monitoring was undertaken using a mobile unit containing continuous monitors for sulphur dioxide, nitrogen oxides, carbon monoxide and PM_{10}.

Table 11.13 EPA Air Quality Data Ferbane, Co. Offaly (4th October 2006 – 29th March 2007)

Parameter	Annual Mean (µg/m^3)	Limit Values (µg/m^3)	
		Stage 1	Stage 2
PM_{10}	18.7	40	20
NO_2	5.2	40	
NO_X	6.7	30	
CO	0.2	10	
SO_2	3.2	20	
Pb	0.002	0.5	

It is likely that the background air pollutant concentrations in the vicinity of the proposed development site are lower than those quoted in Table 11.13 above, as it is in a more rural location than the EPA monitoring station.

11.4 IMPACT ASSESSMENT

11.4.1 Construction Phase

11.4.1.1 Construction Phase Dust

During the construction phase of the proposed development it is predicted that air quality impacts may include:

- Dust generation from the construction phase activities (including clearance; site grading; and the import of construction materials);
- Generation of exhaust fumes by construction plant on site during the construction works; and,
- Possible fugitive emissions of volatile organic compounds (VOCs) from stored fuels and chemicals.

The magnitude of impact for the different construction activities provided above has been estimated without mitigation measures in place. Appropriate mitigation measures are presented later in this section.

A primary source of emissions to air from construction-phase activities is considered to be fugitive dust generation and release, arising during site clearance, the import of construction materials and the actual construction works themselves. The proposed construction phase access routes will generate vehicle movements during the import and export of construction materials. Construction phase traffic will include HGV movements and other construction plant. The processing of imported and excavated materials may also include the temporary stockpiling of materials. The manipulation of imported materials (including screening and compacting) has the potential to generate dust impacts. During the construction phase of the development the potential for dust arisings will be heavily influenced by the nature of the activities taking place and it is recommended that contractors comply with the dust prevention measures stated in Section 11.4.

The magnitude of impact resulting from elevated dust emissions depends on the potential for dust to become and remain airborne prior to returning to the surface as a deposit. Unlike other atmospheric pollutants, the presence of dust and its deposition is particularly dependant upon distance to the receptor locations and prevailing weather conditions, with areas most consistently affected being located close to and downwind of emission sources.

It is possible that the receptors located within 500m of a construction site may experience slightly elevated dust levels during the construction-phase. Construction dust impacts can be considered to be temporary, reversible and short term in nature. Although temporary, an elevation in local dust levels is possible during the construction works, particularly under dry and windy conditions. Therefore, it is considered that the implementation of suitable mitigation measures, as outlined in Section 11.4, should effectively restrict potential dust nuisance episodes and associated impacts. Therefore, with the use of appropriate mitigation measures, the magnitude of dust impact upon the identified receptors (within 500m of the site) is predicted to be negligible.

11.4.1.2 Construction Phase Traffic

During the construction phase it is anticipated that the proposed development will generate up to 4,000 HGV movements. During the peak construction period it is anticipated that on average 15 HGV's will access the site daily, in addition to an estimated 200 vehicle movements during the morning and evening peak hour periods. Thus, the impact of the proposed development in terms of the impact of traffic generated on general air quality will be greater during the construction phase of the development than when operational. Typical construction practices for the proposed power plant will include associated internal construction site traffic, comprising of contractors' vehicles, excavators, diggers, cranes, generators and other diesel-powered vehicles. This will result in emissions of nitrogen oxides, fine particles, benzene, carbon monoxide and other combustion related pollutants. However, emissions of combustion related pollutants from the construction phase activities and traffic are expected to be negligible in terms of the effect on local air quality due to the low vehicle numbers and are therefore not considered further within this assessment.

11.4.2 Operational Phase

The operational impact of the proposed plant has been assessed under the following three modes. These modes encompass worst – case scenario in terms of emissions to atmosphere.

(i) combined cycle using natural gas (CCGT – Gas);
(ii) combined cycle using distillate oil (CCGT – Distillate oil);
(iii) open cycle (by-pass of HRSG) using natural gas (OCGT – Gas).

The details of the operation of the proposed plant are outlined in Chapter 2; Project Description.

In combined cycle mode, the HRSG integral exhaust stacks are the main emission points. Open cycle mode allows the plant to produce electricity from the gas turbines only. In open cycle mode, the by-pass stacks are the emission points.

Distillate oil will be used in the event that natural gas is unavailable. Operation on distillate oil is not expected to exceed 10 days per year. On-site storage is provided for up to five days operation on distillate oil (5,200m^3).

The assessment of the potential impact of the emissions from the power plant, when firing on natural gas or distillate oil, are in accordance with the relevant limit values outlined in the Draft BAT Guidance Note on Best Available Techniques for the Energy Sector (Large Combustion Plant Sector) Final Draft EPA February 2008, the IPPC reference document on BAT for Large Combustion Plants (July 2006) and the Large Combustion Plant (LCP) Directive (2001/80/EC).

11.4.2.1 Dispersion Modelling Inputs

AERMOD has been used to model the emissions from the stacks at the Lumcloon Energy power plant. In order to model the emissions data is required in relation to the emission point stack height and diameter, exit velocity or volume flow rate, temperature and oxides of nitrogen (NO_x), sulphur dioxide (SO_2) and carbon monoxide (CO) emission rates in grams per second. Information related to stack diameters, emission velocities and temperatures as well as the proposed site layout was provided by Lumcloon Energy. Emission concentration limit values for the relevant combustion gases and particulates have been taken from the Draft BAT Guidance Note on Best Available Techniques for the Energy Sector (Large Combustion Plant Sector) Final Draft EPA February 2008. Table 11.14 outlines the emission data for the proposed Lumcloon Power Plant, which were input into the model. The following data was used to accurately determine the likely impact of the emissions from the stack on nearby receptors locations:

Stack Height, Diameter, Gas Conditions and Location:

The proposed CCGT and OCGT stack heights, internal stack diameter and emission rates have been input into the model as outlined in Table 11.14. The following Emission Concentrations (mg/m^3) and Mass Emission Rates (g/s) of oxides of nitrogen (NO_x), nitrogen dioxide (NO_2), carbon monoxide (CO), sulphur dioxide (SO_2) and PM_{10} emissions based on operating limit values for the proposed processes have been input into the dispersion model, as outlined in Table 11.14. The locations of the proposed stacks have been extracted from CAD drawings provided by the project team.

Table 11.14 Emission data for the proposed Lumcloon Power Plant, which have been input into the model, based on emission limit values.

Pollutant	Stack Reference	Stack Diameter (m)[1]	Stack Cross Sectional Area (m^2)	Temp. (C)[1]	Stack Exit Velocity (m/s)[1]	Volume Flow (m^3/s)	Normalised Volume Flow (Nm^3/hr)	Emission Conc. Limit Value (mg/Nm^3)	Mass Emission Rate (g/s)	Emission Concentration Reference
NOx	CCGT – Gas	3.2	8.0384	95	20	160.768	780166.5	50	10.84	LCP Directive / BAT
	CCGT – Distillate oil	3.2	8.0384	95	20	160.768	780166.5	120	26.01	LCP Directive / BAT
	OCGT – Gas	3.2	8.0384	550	32	257.2288	2791639.2	50	38.77	LCP Directive / BAT
CO	CCGT – Gas	3.2	8.0384	95	20	160.768	780166.5	100	21.67	BAT
	CCGT – Distillate oil	3.2	8.0384	95	20	160.768	780166.5	100	21.67	BAT
	OCGT – Gas	3.2	8.0384	550	32	257.2288	2791639.2	100	77.55	BAT
SO_2	CCGT – Gas	3.2	8.0384	95	20	160.768	780166.5	35	7.58	LCP Directive / BAT
	CCGT – Distillate oil	3.2	8.0384	95	20	160.768	780166.5	120	26.01	BAT
	OCGT – Gas	3.2	8.0384	550	32	257.2288	2791639.2	35	27.14	LCP Directive / BAT
PM_{10}	CCGT – Gas	3.2	8.0384	95	20	160.768	780166.5	5	1.08	LCP Directive / BAT
	CCGT – Distillate oil	3.2	8.0384	95	20	160.768	780166.5	30	6.50	N/A
	OCGT – Gas	3.2	8.0384	550	32	257.2288	2791639.2	5	3.88	LCP Directive / BAT

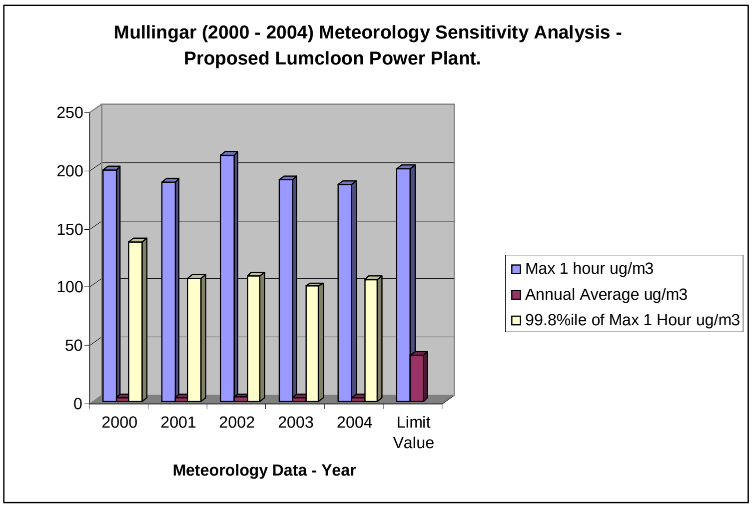
1 Provided by Design Team.
2. LCP Directive = Large Combustion Plant Directive
3. BAT = Best Available Technique
4. CCGT – Gas = combined cycle (turbine and HRSG) using natural gas
5. CCGT – Distillate oil = combined cycle using distillate oil
6. OCGT – Gas = open cycle (by-pass of HRSG) using natural gas

Meteorological Data

Five years of hourly sequential meteorological data (Mullingar – 2000 to 2004) was used in the air dispersion modelling assessment. The Mullingar meteorological station is located approximately 45km to the North East of the Lumcloon Power Plant site. This meteorological data is appropriate for use in the dispersion modelling assessment as it is representative of conditions in central Ireland and appropriate to assess the potential impact of the proposed Lumcloon Power Plant. A meteorological data sensitivity analysis of the meteorological data (Mullingar – 2000 to 2004) was carried out. This involved a preliminary run of the model using each year of Met. data from 2000 to 2004 in order to determine the year of meteorological data, which gives rise to the worst-case ground level concentration predictions. In terms of worst-case ground level concentration predictions, meteorological data from 2002 was found to predict worst-case ground level concentrations. This allowed for the determination of the predicted worst-case long term (annual average) and short term (1-hour, 8-hour and 24-hour) impacts of emissions from the Lumcloon Power Plant.

Table 11.15 Meteorology Sensitivity Analysis based on maximum predicted ground level NOx concentrations and a 43m stack height

Meteorology Data - Year	Annual Average NOx Conc. (µg/m^3)	Max 1 hour NOx Conc. (µg/m^3)	99.8 %ile of Max 1 Hour NOx Conc. (µg/m^3)
2000	3.33	198.43	137
2001	2.84	188.36	106
2002	3.6	211.05	107.99
2003	2.82	190.45	98.86
2004	3.1	186.38	104.58
Limit Value	40	200	

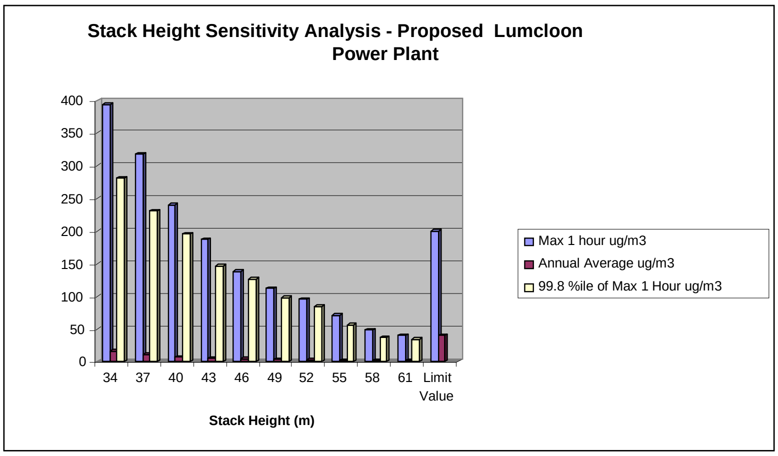


Stack Height Sensitivity Analysis

A stack height sensitivity analysis was determined for the proposed CCGT stacks. Stack heights in the range of 34m, 37m, 40m, 43m, 46m, 49m, 52m, 55m, 58m and 61m were modelled as part of this sensitivity analysis. This established that the stack height of a minimum stack height of 49 metres was sufficient to allow for appropriate dispersion of stack emissions from the site. This stack height was subsequently used to calculate the predicted worst-case long term (annual average) and short term (1-hour, 8-hour and 24-hour) impacts of emissions from the Lumcloon Power Plant.

Table 11.16 Stack (Combined Cycle) Height Sensitivity Analysis based on maximum predicted ground level NOx concentrations.

Height (metres)	Annual Average NOx Concentrations (μg/m^3)	Max 1 hour NOx Concentrations (μg/m^3)	99.8 %ile of Max 1 Hour NOx Concentrations (μg/m^3)
34	15.93	393.72	281.1
37	10.8	318.03	230.75
40	6.79	240.05	195.94
43	5	187.66	146.28
46	4.22	138.43	126.51
49	**3.39**	**112.42**	**98.37**
52	2.65	95.32	84.74
55	2.07	71.66	56.02
58	1.71	48.33	37.34
61	1.5	39.94	34.36
Limit Value	40	200	



Building Downwash Effects

Buildings can affect the local mechanical turbulence around the point of release. Air moving over buildings increases in velocity and can cause downwash downwind of the source. Releases can be partly or wholly entrained into the building slip-stream leading to occasional elevated local ground level concentrations when wind direction increases the influence of nearby buildings on dispersion of the plume. Due to this fact, stack heights as well as building dimensions, shape and orientations have been incorporated into the model. These building dimensions have been extracted from drawings provided by the project design team.

Surface Roughness

The surface roughness conditions in the vicinity of the site have been adjusted for rural surroundings.

Receptors & Cartesian Grids

The *AERMOD* model calculates ground level pollutant concentrations at receptor points in the vicinity of the stack. Ground level pollutant concentrations were predicted at the nearest residential properties in proximity to the proposed development site. Ground level pollutant concentrations were predicted at every node on two Cartesian grids as follows;

- Large Cartesian grid – 12,800m x 13,000m area @ 200m intervals (SW Coordinates – 206850, 213250)
- Small Cartesian grid – 3,000m x 3,000m area @ 50m intervals (SW Coordinates – 212250, 218250)

Time Averaging and Percentiles

The time averaging and percentiles have been calculated in terms of the pollutant concentration limit values criteria detailed in the air quality standards. The averaging times for NO2, SOx and CO were selected in terms of the relevant air quality standards.

The predicted output concentrations from the AERMOD model have been reported below. Combustion of fossil fuels, such as natural gas, produces various forms of nitrogen oxides (NOx). The combustion of natural gas in a gas turbine results in approximately 90 - 95% of the NOx in the form of NO, with most of the remainder being NO_2. In relation to NO_2 emissions from the stacks it has been assumed that due to the limited availability of oxidants and sunlight, a 50% conversion of NO to NO_2 has been considered for the maximum 1 hour averaging periods. Total conversion of all NOx to NO_2 has been used for the estimation of the annual mean NO_2 concentrations to determine the maximum NO_2 formation, based on the assumption that all NO emitted is converted to NO_2. NO_2 emissions were calculated as a

99.8th percentile of max 1-hour average and as an annual average as these represent the time averaged limit values specified for NO_2 in the relevant air quality standards. CO emissions were calculated as a running 8-hour average as this represents the averaged limit value specified for CO in the relevant air quality standards. SO_2 emissions were calculated as a 99.7th percentile of max 1-hour average, as a 99.2th percentile of max 24 hour averages and as an annual average as these represent the time averaged limit values specified for SO_2 in the relevant air quality standards. PM10 has been calculated as a 90.4th percentile of max 24-hour average. Where appropriate, the time averaging and percentiles have been calculated in terms of the pollutant concentration limit values criteria detailed in Table 11.1.

11.4.2.2 Dispersion Modelling Results

The approach to the assessment of the potential impact on ambient air quality of the emissions from the stacks has involved the following:

- Quantification of the local Ambient Concentration (AC) from consideration of EPA monitoring data and local air quality monitoring data, as outlined in Section 11.3 above. The background Ambient Concentration (AC) selected for presentation of the results is based on results of the EPA Air Quality Data Ferbane, Co. Offaly (4th October 2006 – 29th March 2007) – See Table 11.9
- Quantitative assessment of the operational emissions on local air quality from the stacks utilising the AERMOD dispersion model and a quantification of the Process Contributions (PC) from the proposed power plant
- Assessment of the resultant Predicted Environmental Concentrations (PEC) taking into account cumulative effects through addition of the Ambient Concentration (AC) and the Process Contributions (PC) from the proposed power plant

In order to obtain the predicted annual average Predicted Environmental Concentrations (PEC), annual average background concentration levels from the Ferbane, Co. Offaly Air Quality Monitoring Station were added directly to the process concentration.

As outlined by The UK Environment Agency, the short-term maximum Predicted Environmental Concentrations (PEC) due to emissions from elevated sources cannot be combined in the same way. An estimate of the maximum combined pollutant concentration can be obtained for NO_2, SO_2 and PM_{10} as follows:

NO_2 - The 99.8th percentile of total NO_2 is equal to the minimum of either a) or b) below:

a) 99.8th percentile hourly background total oxidant (O_3 & NO_2) + 0.05 x (99.8th%ile process contribution NO_X)

b) The maximum of either:

- 99.8th percentile process contribution NO_X + 2 x (annual mean background NO_2); or
- 99.8th percentile hourly background NO_2 + 2 x (annual mean process contribution NO_x).

SO_2 - The 99.7th percentile of total 1-hour SO_2 is equal to the maximum of either a) or b) below:

a) 99.7th percentile hourly background SO_2 + (2 x annual mean process contribution SO_2)
b) 99.7th percentile hourly process contribution SO_2 + (2 x annual mean background contribution SO_2)

The 99.2th percentile of total 24-hour SO_2 is equal to the maximum of either a) or b) below:

a) 99.2th percentile of 24-hour mean background SO_2 + (2 x annual mean process contribution SO_2)
b) 99.2th percentile 24-hour mean process contribution SO_2 + (2 x annual mean background contribution SO_2).

PM_{10} - The 90.4th percentile of total 24-hour mean PM_{10} is equal to the maximum of either a) or b) below:

a) 90.4th percentile of 24-hour mean background PM_{10} + annual mean process contribution PM_{10}
b) 90.4th percentile 24-hour mean process contribution PM_{10} + annual mean background PM_{10}

11.4.2.3 Summary of Pollutant Emissions

The proposed power plant will release combustion gases through the burning of natural gas, which will give rise to emissions of nitrogen oxides (NOx), carbon monoxide (CO) and very low quantities of sulphur dioxide and particulates (PM_{10}) when run on natural gas, which will be the predominantly used fuel. As stated above, during periods of interrupted gas supply or during plant testing, the plant will be fired on back-up distillate oil. The combustion of distillate oil will give rise to emissions of nitrogen oxides (NOx), carbon monoxide (CO), sulphur dioxide and particulates (PM_{10}). The sulphur content of distillate oil (limited to 0.1% by mass) will lead to emissions of sulphur dioxide (SO_2) and there will also be higher emissions of particulates (PM_{10}) when run on distillate oil as compared to operation on natural gas. As stated above, distillate oil will be used in the event that natural gas is unavailable. Operation on distillate oil is not expected to exceed 10 days per year.

For the purposes of this air quality impact assessment, all of the emissions have been assessed based on the emission limit concentration values from each proposed stack as outlined in the Large Combustion Plant Directive. Therefore, this is a worst case assessment as it unlikely that the emission stacks will emit pollutants at or above the emission limit concentration values.

The proposed power plant will also result in high levels of carbon dioxide (CO_2) emissions. However, CO_2 does not affect human health except in extremely high concentrations and therefore, emissions of CO_2 are not relevant for local air quality impact assessment and are not considered further through dispersion modelling. CO_2 emissions from the proposed plant are dealt with in further detail in Chapter 12.

The assessment of the potential impact of emissions on ambient air quality from the proposed power plant has been completed for the following scenarios:

- Scenario 1 Combined cycle (turbine and HRSG) using natural gas (CCGT – Gas);
  Most likely operating scenario. The average running time for the CCGT unit will be in excess of 6,000 hours per year. However, this unit will operate up to 24 hours a day for certain periods, as dispatched by the Transmission System Operator, depending on demand, wind generation and alternative generating capacity available on the grid.

- Scenario 2 Combined cycle using distillate oil (CCGT – Distillate oil);
  Very irregular operating scenario, not expected to exceed 10 days per year.

- Scenario 3 Open cycle (by-pass of HRSG) using natural gas (OCGT – Gas).
  It is expected that the OCGT unit will have a much lower load factor, with annual running of *c.* 500 hours per annum. It will typically operate during the morning peak (06:00 – 09:00) and during the evening peak (17:00 – 19:00).

The predicted Maximum Ground Level Concentrations ($\mu g/m^3$) results of the air dispersion modelling assessment presented in Tables 11.17 to 11.19 and in Appendix 11.1 - Figures 1 to

12. These are the highest predicted concentrations in the vicinity of the proposed power plant. The actual predicted concentrations at all of the sensitive receptor locations, i.e. the nearby residential properties, are significantly lower than those concentrations reported in Tables 11.17 to 11.19 as can be seen by the concentration isopleths as presented in Appendix 11.1 - Figures 1 to 12.

11.4.2.4 Scenario 1 – Combined Cycle Using Natural Gas (CCGT – Gas)

Table 11.17 Scenario 1: Predicted Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), particulates (PM_{10}) and Sulphur Dioxide (SO_2) maximum ground level concentrations.

Pollutant	Period Average	Ambient Conc. (AC) (µg/m^3) Note 1	Predicted Maximum Ground Level Conc.(µg/m3) - Process Contributions (PC)	Predicted Environmental Conc. (PEC) (µg/m^3)	Limit Value µg/m³	Legislation Type / Description	Figure No.
Nitrogen Dioxide (NO2)	99.8th %ile of Maximum 1 Hour Conc.	10.4	49.19 Note 2	59.59	200	- Not to be exceeded more than 18 times per year (31/12/05)	1
	Annual Mean Conc.	5.2	3.4	8.6	40	- Annual Mean Limit (31/12/04)	2
Nitrogen Oxides (NOx)	Annual Mean Conc.	13.4	3.4	16.8	30	- Annual Mean Limit (19/07/01) - Protection of ecosystems	2
Carbon Monoxide (CO)	Running 8 - Hour Mean	2000	198.62	2198.62	10,000	- Running 8 – Hour Mean (31/12/03)	3
Sulphur Dioxide (SO2)	99.7th %ile of Maximum 1 Hour Conc.	6.4	64.36	70.76	350	- Not to be exceeded more than 24 times per year (31/12/04)	4
	99.2th %ile of Maximum 24 Hour Conc.	6.4	24.13	30.53	125	- Not to be exceeded more than 3 times per year (31/12/04)	5
	Annual Mean Conc.	3.2	2.38	5.58	20	- Annual Mean Limit (31/12/00) - Protection of ecosystems	6
Particulates (PM10)	90.4th %ile of Maximum 24 Hour Conc.	18.7	1.1	19.8	50	- Not to be exceeded more than 35 times per year (31/12/04)	7
	Annual Mean Conc.	18.7	0.34	19	40	- Annual Mean Limit (31/12/04)	8

Note 1: Ambient Concentration (AC) based on the EPA Air Quality Data Ferbane, Co. Offaly (4th October 2006 – 29th March 2007)

Note 2: Assumed conversion rate for NO_x to NO_2 = 0.5.

Discussion of Results (Scenario 1):

- Nitrogen Dioxide (NO_2)

The NO_2 modelling results indicate that the maximum short term and annual mean ambient ground level concentrations are below the relevant air quality standards when using natural gas for a full year. NO_2 emissions equate to a process contribution of ambient NO_2 concentrations which are approximately 25% of the maximum ambient 1-hour limit value, as a 99.8th %ile, based on a conversion factor for NOx to NO_2 of 0.5. The process contribution of ambient Annual Mean NO_2 concentrations, of 3.4 µg/m^3, is <10% of the annual mean limit value. When background concentrations are included as appropriate, the Predicted Environmental Concentrations (PEC) values rise to 30% of the maximum ambient 1-hour limit value and 21.5% of the annual limit value. At the nearest residential receptor location, in terms of increased NO_2 emissions, the proposed development will result in a slight adverse impact.

- Nitrogen Oxides (NOx)

Maximum ground level ambient annual mean NOx concentrations directly due to process emissions are approximately 11% of the annual mean limit value for the protection of vegetation. At the nearest sensitive ecological receptors, i.e. Lough Boora pNHA located approximately 3km to the south east of the site and the Grand Canal pNHA located approximately 3km to the north of the site, the ambient annual mean NOx concentrations directly due to process emissions are <1% of the annual mean limit value. At the Moyclare Bog and Ferbane Bog Special Areas of Conservation (SAC), located approximately 7km to the north east of the proposed development site, the ambient annual mean NOx concentrations directly due to process emissions will be insignificant. At the nearest sensitive ecological receptors, in terms of increased NO_x emissions, the proposed development will result in a negligible impact.

- Carbon Monoxide (CO)

Maximum ground level ambient Running 8 - Hour Mean CO concentrations directly due to process emissions are predicted to be approximately 2% of the relevant limit value. At the nearest residential receptor location, in terms of increased CO emissions, the proposed development will result in a negligible impact.

- Sulphur Dioxide (SO_2)

SO_2 emissions from the combustion of natural gas are insignificant. When modelled at the emission limit values as outlined in the Large Combustion Plant Directive, SO_2 emissions equate to a process contribution of ambient SO_2 concentrations which are approximately 18%

of the maximum ambient 1-hour limit value, as a 99.7th %ile and approximately 19% of the maximum ambient 24-hour limit value, as a 99.2th %ile. The process contribution of ambient Annual Mean SO_2 concentrations, of 2.38 µg/m^3, is approximately 12% of the annual mean limit value.

At the nearest sensitive ecological receptors, i.e. Lough Boora pNHA located approximately 3km to the south east of the site and the Grand Canal pNHA located approximately 3km to the north of the site, the ambient annual mean SO_2 concentrations directly due to process emissions are <1% of the annual mean limit value. At the Moyclare Bog and Ferbane Bog Special Areas of Conservation (SAC), located approximately 7km to the north east of the proposed development site, the ambient annual mean SO_2 concentrations directly due to process emissions will be insignificant. At the nearest residential receptor location, in terms of increased SO_2 emissions, the proposed development will result in a slight adverse impact.

- Particulates (PM_{10})

The PM_{10} modelling results indicate that the maximum short term and annual mean ambient ground level concentrations are below the relevant air quality standards when using natural gas for a full year. PM_{10} emissions equate to a process contribution of ambient PM_{10} concentrations which are approximately 2% of the maximum ambient 24-hour limit value, as a 90.4th %ile. The process contribution of ambient Annual Mean PM_{10} concentrations, of 0.34 µg/m^3, is <1% of the annual mean limit value. When background concentrations are included as appropriate, the Predicted Environmental Concentrations (PEC) values rise to approximately 40% of the maximum ambient 1-hour limit value and 47.5% of the annual limit value. At the nearest residential receptor location, in terms of increased PM_{10} emissions, the proposed development will result in a negligible impact.

11.4.2.5 Scenario 2 – Combined Cycle using Distillate Oil (CCGT – Distillate oil);

Table 11.18 Scenario 2: Predicted Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Particulates (PM_{10}) and Sulphur Dioxide (SO_2) maximum ground level concentrations.

Pollutant	Period Average	Ambient Conc. (AC) (µg/m^3) [Note 1]	Predicted Maximum Ground Level Conc. (µg/m^3) - Process Contributions (PC)	Predicted Environmental Conc. (PEC) (µg/m^3)	Limit Value µg/m³	Legislation Type / Description
Nitrogen Dioxide (NO2)	99.8th %ile of Maximum 1 Hour Conc.	10.4	118.02 Note 2	128.42	200	- Not to be exceeded more than 18 times per year (31/12/05)
	Annual Mean Conc.	5.2	8.16	13.36	40	- Annual Mean Limit (31/12/04)
Nitrogen Oxides (NOx)	Annual Mean Conc.	13.4	8.16	21.56	30	- Annual Mean Limit (19/07/01) - Protection of ecosystems
Carbon Monoxide (CO)	Running 8 - Hour Mean	2000	198.62	2198.62	10,000	- Running 8 – Hour Mean (31/12/03)
Sulphur Dioxide (SO2)	99.7th %ile of Maximum 1 Hour Conc.	6.4	220.85	227.25	350	- Not to be exceeded more than 24 times per year (31/12/04)
	99.2th %ile of Maximum 24 Hour Conc.	6.4	82.8	89.2	125	- Not to be exceeded more than 3 times per year (31/12/04)
	Annual Mean Conc.	3.2	8.16	11.36	20	- Annual Mean Limit (31/12/00) - Protection of ecosystems
Particulates (PM10)	90.4th %ile of Maximum 24 Hour Conc.	18.7	6.65	25.35	50	- Not to be exceeded more than 35 times per year (31/12/04)
	Annual Mean Conc.	18.7	2.04	20.74	40	- Annual Mean Limit (31/12/04)

Note 1: Ambient Concentration (AC) based on the EPA Air Quality Data Ferbane, Co. Offaly (4th October 2006 – 29th March 2007)

Note 2: Assumed conversion rate for NO_x to NO_2 = 0.5.

Discussion of Results:

As stated above, Scenario 2 - Combined cycle using distillate oil (CCGT – Distillate oil) will be a very irregular operating scenario, not expected to exceed 10 days per year. Therefore, while a comment has been made on the predicted ambient annual mean concentrations due to this scenario it is only the short – term maximum ground level concentrations which are likely to be of significance.

- Nitrogen Dioxide (NO_2)

The NO_2 modelling results indicate that the maximum short term ambient ground level concentrations are below the relevant air quality standard when using distillate oil. NO_2 emissions equate to a process contribution of ambient NO_2 concentrations which are approximately 60% of the maximum ambient 1-hour limit value, as a 99.8th %ile, based on a conversion factor for NOx to NO_2 of 0.5. The process contribution of ambient Annual Mean NO_2 concentrations, of 8.16µg/m^3, is approximately 25% of the annual mean limit value. When background concentrations are included as appropriate, the Predicted Environmental Concentrations (PEC) values rise to approximately 64% of the maximum ambient 1-hour limit value and 72% of the annual limit value. At the nearest residential receptor location, in terms of increased NO_2 emissions, the proposed development will result in a slight adverse impact.

- Nitrogen Oxides (NOx)

Maximum ground level ambient annual mean NOx concentrations directly due to process emissions are approximately 25% of the annual mean limit value for the protection of vegetation. At the nearest sensitive ecological receptors, i.e. Lough Boora pNHA located approximately 3km to the south east of the site and the Grand Canal pNHA located approximately 3km to the north of the site, the ambient annual mean NOx concentrations directly due to process emissions are <1% of the annual mean limit value. At the Moyclare Bog and Ferbane Bog Special Areas of Conservation (SAC), located approximately 7km to the north east of the proposed development site, the ambient annual mean NOx concentrations directly due to process emissions will be insignificant. At the nearest sensitive ecological receptors, in terms of increased NO_x emissions, the proposed development will result in a negligible impact.

- Carbon Monoxide (CO)

Maximum ground level ambient Running 8 - Hour Mean CO concentrations directly due to process emissions are predicted to be approximately 2% of the relevant limit value. At the nearest residential receptor location, in terms of increased CO emissions, the proposed development will result in a negligible impact.

- Sulphur Dioxide (SO_2)

SO_2 emissions from the combustion of distillate oil are more significant than natural gas. When modelled at the emission limit values as outlined in the Large Combustion Plant Directive, SO_2 emissions equate to a process contribution of ambient SO_2 concentrations which are approximately 62% of the maximum ambient 1-hour limit value, as a 99.7th %ile and approximately 66% of the maximum ambient 24-hour limit value, as a 99.2th %ile. The process contribution of ambient Annual Mean SO_2 concentrations of 8.16 μg/m^3, is approximately 40% of the annual mean limit value. At the nearest residential receptor location, in terms of increased SO_2 emissions, the proposed development will result in a slight adverse impact.

- Particulates (PM_{10})

The PM_{10} modelling results indicate that the maximum short term ambient ground level concentrations are below the relevant air quality standards when using distillate oil. PM_{10} emissions equate to a process contribution of ambient PM_{10} concentrations which are approximately 13% of the maximum ambient 24-hour limit value, as a 90.4th %ile. The process contribution of ambient Annual Mean PM_{10} concentrations, of 2.04μg/m^3, is approximately 5% of the annual mean limit value. When background concentrations are included as appropriate, the Predicted Environmental Concentrations (PEC) values rise to approximately 50% of the maximum ambient 1-hour limit value and 52% of the annual limit value. In terms of increased PM_{10} emissions, the proposed development will result in a negligible impact.

11.4.2.6 Scenario 3: Open Cycle (by-pass of HRSG) using natural gas (OCGT – Gas).

Table 11.19 Scenario 3: Predicted Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), particulates (PM_{10}) and Sulphur Dioxide (SO_2) maximum ground level concentrations.

Pollutant	Period Average	Ambient Conc. (AC) ($\mu g/m^3$) [Note 1]	Predicted Maximum Ground Level Conc. ($\mu g/m^3$) - Process Contributions (PC)	Predicted Environmental Conc. (PEC) ($\mu g/m^3$)	Limit Value $\mu g/m^3$	Legislation Type / Description	Figure No.
Nitrogen Dioxide (NO2) Note 2	99.8th %ile of Maximum 1 Hour Conc.	10.4	218.0	228.4	200	- Not to be exceeded more than 18 times per year (31/12/05)	9
	Annual Mean Conc.	5.2	12.38	17.58	40	- Annual Mean Limit (31/12/04)	-
Nitrogen Oxides (NOx)	Annual Mean Conc.	13.4	12.38	25.78	30	- Annual Mean Limit (19/07/01) - Protection of ecosystems	-
Carbon Monoxide (CO)	Running 8 - Hour Mean	2000	2376	4376	10,000	- Running 8 – Hour Mean (31/12/03)	-
Sulphur Dioxide (SO2)	99.7th %ile of Maximum 1 Hour Conc.	6.4	292.8	299.2	350	- Not to be exceeded more than 24 times per year (31/12/04)	10
	99.2th %ile of Maximum 24 Hour Conc.	6.4	121.8	128.2	125	- Not to be exceeded more than 3 times per year (31/12/04)	11
	Annual Mean Conc.	3.2	8.66	11.86	20	- Annual Mean Limit (31/12/00) - Protection of ecosystems	-
Particulates (PM10)	90.4th %ile of Maximum 24 Hour Conc.	18.7	4.7	23.4	50	- Not to be exceeded more than 35 times per year (31/12/04)	12
	Annual Mean Conc.	18.7	1.23	19.93	40	- Annual Mean Limit (31/12/04)	-

Note 1: Ambient Concentration (AC) based on the EPA Air Quality Data Ferbane, Co. Offaly (4th October 2006 – 29th March 2007)

Note 2: Assumed conversion rate for NO_x to NO_2 = 0.5.

Discussion of Results:

As stated above, Scenario 3 - Open cycle (by-pass of HRSG) using natural gas (OCGT – Gas) will have a much lower load factor, with annual running of *c.* 500 hours per annum and will typically operate during the morning peak (06:00 – 09:00) and during the evening peak (17:00 – 19:00). In open cycle mode, the by-pass stacks are the emission points. It is not relevant to comment on the predicted ambient annual mean concentrations due to this scenario. Only short – term maximum ground level concentrations have been discussed below.

- Nitrogen Dioxide (NO_2)

The NO_2 modelling results indicate that the maximum short term ambient ground level concentrations within the site boundary are marginally above the relevant air quality standard when the open cycle (by-pass of HRSG) using natural gas is in operation. This is due to building downwash effects on the emitted plume. While this level exceeds the ambient air quality standard it is well below the relevant Occupational Exposure Level for nitrogen dioxide. However, the maximum NO_2 short term ambient ground level concentrations outside of the site boundary and in the vicinity of the nearest residential properties are well within the relevant air quality standard. It must also be reiterated that this modelling scenario assumes worst-case emissions at emission limit concentration values.

Outside of the site boundary, in the vicinity of the nearest residential properties, the NO_2 emissions equate to a process contribution of ambient NO_2 concentrations which are approximately 12.5% of the maximum ambient 1-hour limit value, as a 99.8^{th} %ile, based on a conversion factor for NOx to NO_2 of 0.5. When background concentrations are included as appropriate, the Predicted Environmental Concentrations (PEC) values rise to approximately 18% of the maximum ambient 1-hour limit value. At the nearest residential receptor location, in terms of increased NO_2 emissions, the proposed development will result in a moderate adverse impact.

- Carbon Monoxide (CO)

Maximum ground level ambient Running 8 - Hour Mean CO concentrations directly due to process emissions are predicted to be approximately 24% of the relevant limit value. At the nearest residential receptor location, in terms of increased CO emissions, the proposed development will result in a slight adverse impact.

- Sulphur Dioxide (SO_2)

SO_2 emissions from the open cycle (by-pass of HRSG) using natural gas, when modelled at the emission limit values as outlined in the Large Combustion Plant Directive, equate to a process contribution of ambient SO_2 concentrations which are approximately 83% of the maximum ambient 1-hour limit value, as a 99.7th %ile and approximately 97% of the maximum ambient 24-hour limit value, as a 99.2th %ile. As stated above, this is due to building downwash effects on the emitted plume. However, the maximum SO_2 short term ambient ground level concentrations outside of the site boundary and in the vicinity of the nearest residential properties are well within the relevant air quality standards. At the nearest residential receptor location, in terms of increased NO_2 emissions, the proposed development will result in a moderate adverse impact.

- Particulates (PM_{10})

The PM_{10} modelling results indicate that the maximum short term ambient ground level concentrations are below the relevant air quality standards from the open cycle (by-pass of HRSG) using natural gas. PM_{10} emissions equate to a process contribution of ambient PM_{10} concentrations which are approximately 10% of the maximum ambient 24-hour limit value, as a 90.4th %ile. When background concentrations are included as appropriate, the Predicted Environmental Concentrations (PEC) values rise to approximately 47% of the maximum ambient 1-hour limit value. In terms of increased PM_{10} emissions, the proposed development will result in a negligible impact.

11.4.2.7 Emissions from Operational Traffic

It is estimated that the proposed power plant when operational will generate approximately sixty vehicles (based on shift workers and day workers) per day with on average one HGV delivery vehicle to and from the site per week. This level of traffic volume will not generate a significant local air quality impact and greenhouse gas emissions from vehicular traffic will be negligible. The impact on background concentrations due to the additional staff and site traffic during the operation phase will lead to levels which are significantly below the ambient air quality limit values. Due to these very low projected traffic volumes the air quality impact has not been further assessed in further detail using the UK Dept. of Transport, *Design Manual for Roads and Bridges* (2007), Volume 11, Section 3, Part 1, Air Quality.

11.5 MITIGATION MEASURES

This section details the proposed methodology by which potential impacts resulting from the proposed power plant development during the construction and operational phases may be mitigated.

11.5.1 Construction Phase Mitigation Measures

During the construction phase of the proposed power plant development, the following dust minimisation measures should be implemented to reduce the potential for dust migration from the site and from construction traffic using public and temporary roads. This will involve the following good site/management practices:

- A Dust Action / Minimisation Plan will be formulated for the construction phase
- The Contractor shall take all necessary precautions to prevent dust nuisance arising from the Works and shall include for watering, surface dressing haul roads, or any other necessary measures which may be required from time to time. The prevention of dust nuisance shall apply to work carried out on the Site or to mixing / batching plants and the like established at the site, if required, for the purposes of supplying materials for the Works.
- Site roads will be regularly cleaned and maintained as appropriate. Hard surface roads shall be swept to remove mud and aggregate materials from their surface while unsurfaced roads shall be restricted to essential site traffic only.
- A temporary truck wheel wash shall be installed and all trucks exiting the site will have their wheels and undercarriage washed down to avoid deposition of any soil, etc. onto the public road system.
- Public roads shall be regularly inspected for cleanliness and cleaned as necessary
- A mobile bowser shall be used during dry periods to dampen vehicle route ways and help mitigate dust emissions
- Site speed limits shall be used to prevent the unnecessary generation of fugitive dust emissions
- Lorries/trucks shall be properly covered or enclosed during transportation of construction materials to prevent their escape along public roads
- Adherence to good site engineering practices shall assist in reducing dust generation.
- The storage of fuel and/or the location of re-fuelling operations shall not occur in a position that could give rise to nuisance from fugitive VOC emissions.

In addition to the measures stated above, the construction phase activities shall be conducted in accordance with the Construction Dust Management Plan (DMP) set around trigger conditions that may potentially cause dust nuisance to arise. These trigger conditions should take account of conditions such as prevailing meteorology (such as wind speed and direction) and local conditions such as low soil moisture due to prolonged periods of hot and dry weather. The DMP should provide for additional dust suppression measures beyond normal and routine dust abatement measures. Typically, these additional suppression measures may include the use of extra water bowsers and sprays, the application of chemical dust suppressants (if appropriate), cessation of activities under adverse weather conditions and dust monitoring, as appropriate.

Additional advice regarding best practice measures are provided in Building Research Establishment (BRE) Pollution Control Guides, specifically:

BRE (2003) Controlling Particles, Vapour and Noise Pollution from Construction Sites

- Part 1: Pre-project planning and effective management
- Part 2: Site preparation, demolition, earthworks and landscaping
- Part 3: Haulage routes, vehicles and plant
- Part 4: Materials handling, storage, stockpiles, spillage and disposal
- Part 5: Fabrication processes and internal and external finishes

The BRE Pollution Control Guide considers individual construction processes, activities that generate particles, methods of controlling emissions and management and monitoring measures. Through pre-project planning and management, pollution emissions from the construction phase should be controlled in an effective manner.

11.5.2 Operational Phase Mitigation Measures

Lumcloon Energy propose to fit a dry low NOx burners to the gas turbine to optimise the air /fuel ratio producing a uniform low temperature flame in the combustion chamber to minimise the production of NOx. Dry low NOx burners are recommended as Best Available Technique (BAT) for new gas turbines. This procedure is recommended as Best Available Technique (BAT) for liquid fuel fired gas turbines. The Large Combustion Plant Directive provides for NOx emissions of up to 75mg/m^3, where the overall efficiency is greater than 55%. It is anticipated that the proposed power plant will have an efficiency in a range of 54% to 57% when operating as combined cycle

These emission controls will be adopted into the design of the plant to ensure that the air quality objectives set out in the Air Quality Standards are achieved in the vicinity of the proposed development and at the nearby residential receptors. The design of the plant and the incorporation of the emission controls have been considered according to the principle of Best Available Technique (BAT).

The Stack Height Sensitivity analysis has indicated that CCGT HRSG integral exhaust stack and OCGT bypass stack heights of 49m and 36m respectively have been proposed to ensure effective dispersion of combustion gas emissions from the proposed plant.

11.6 RESIDUAL IMPACTS

The long term impact of the proposed development on local air quality will not be significant in the future years of operation assuming that the proposed abatement equipment is maintained to a high standard.

The results of the air dispersion modelling exercise indicate that the maximum ground level concentrations (including background concentrations), for each scenario, on the basis of emission limit concentrations, do not result in an exceedence of the relevant Air Quality Standards at the nearby residential receptor locations. Operation on combined cycle (turbine and HRSG) using natural gas - results in the lowest predicted ground level concentrations in the vicinity of the plant. As detailed in Chapter two of this EIS, the plant will primarily operate in this mode. The emission limit concentration values as assessed in the air dispersion modelling assessment are based on the requirements of the Large Combustion Plant Directive and Best Available Techniques (BAT).

No significant impacts on local air quality have been identified during the construction phase.

As it is predicted that emissions from the proposed plant will result in ambient concentrations at the nearby sensitive receptors within the relevant air quality limit values, there are no predicted health impacts associated with emissions from the proposed development.

12.0 CLIMATE

12.1 INTRODUCTION

The potential impacts of the proposed gas fired power plant at Lumcloon on climate are addressed in this section with specific reference to the generation of greenhouse gases from operational activities and from traffic associated with the construction and operational phases of the proposed development.

12.2 RECEIVING ENVIRONMENT

12.2.1 Microclimate

The climate of the area is best described by meteorological measurements collected by the National Meteorological Service from the meteorological stations at Birr, Co. Offaly and Mullingar, Co. Westmeath; the nearest met stations to the proposed development. To characterise the prevailing conditions at the site, historical meteorological data compiled by Met Eireann (www.meteireann.ie) is presented for Birr and Mullingar for the period 1981-1990. The most important meteorological parameters in relation to the proposed development are wind speed, rainfall and temperature.

Birr Station is located 1.5 Km ESE of Birr Town, Co. Offaly (53°5'25" N, 7°53'25"W) at 73M above mean sea level. Birr station is located approximately 15 km from the proposed site. Mullingar Synoptic Station is situated approximately 1.7 Km northwest of Mullingar, Co. Westmeath (53° 32' 14" N 07° 21' 44" W) at 104M above mean sea level. Mullingar station is located approximately 45 km from the proposed site.

The prevailing weather conditions at the site of the proposed development and that at Birr and Mullingar meteorological station is not expected to be significantly different.

12.2.1.1 Mullingar Wind Data

Outlined below is a windrose and tabulated data for wind direction and wind speeds in the area of the proposed development site. This data has been used for the purposes of the air dispersion modeling exercise carried out as part of the local air quality impact assessment. Figure 12.1 indicates the predominant wind direction is south-westerly. The wind speed is greater than 10 knots for approximately 3% of the measured met data from 2000 to 2004 (See Figure 12.2).

Figure 12.1 Mullingar Windrose Diagram detailing wind speed and direction (Blowing to) from 2000 to 2004

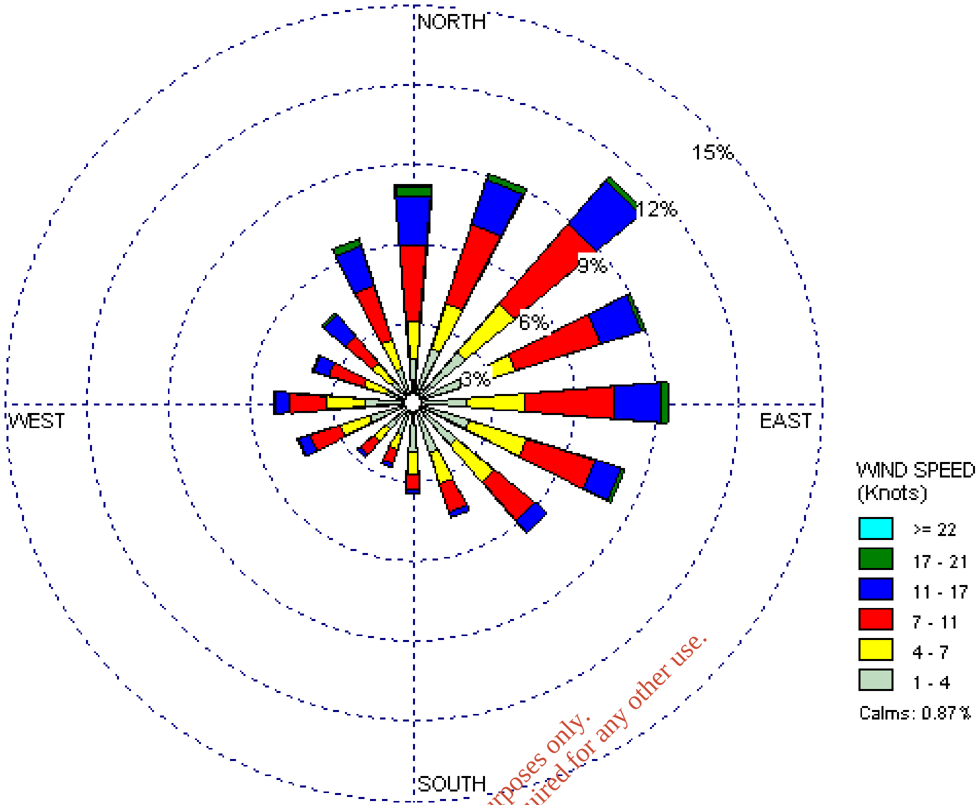
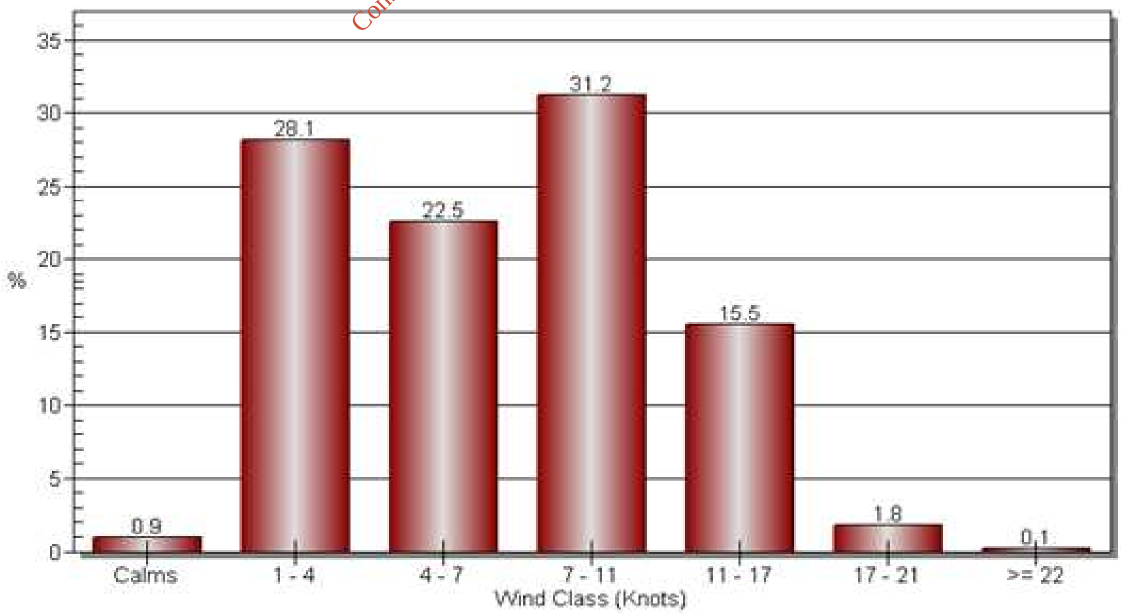


Figure 12.2 Mullingar wind speed frequency distribution (2000 – 2004)



Solar Radiation

Mean monthly Solar Radiation data from Birr for 2009, 2008 and mean value from 1981-1990 is presented in Table 12.1. No solar radiation data is available for Mullingar Met station.

Table 12.1 Solar Radiation Data for Birr Meteorological Station

Global Solar Radiation in Joules/cm^2 for Birr													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
2009	7745	12237	27780	36039	51710	-	-	-	-	-	-	-	187463
2008	6849	13904	26502	41033	54000	48593	45087	33549	29031	17961	8511	5643	330663
Mean	7205	12563	24060	38647	50261	48440	49530	39060	29348	17288	9201	5522	331127

Note: Data for the most recent months are provisional. Solar radiation means are presented for 1981-1990.

Precipitation

Rainfall data for 2008 and 2009 to date along with average monthly and annual precipitation rates over the period 1961 – 1990 for Birr and Mullingar are presented in Table 12.2 (a) and Table 12.2 (b). The results show that the annual average rate of precipitation for 2008 in Birr and Mullingar is 1,017 mm and 1,065, respectively. The average monthly rainfall values in 2008 at Birr range from 30.7 mm in April to 181.5 mm in August. In the summer months, high rainfall amounts tend to be associated with intense thunder showers which may be localised in rainfall intensity.

Table 12.2(a) Mean Monthly Rainfall Data for Birr Meteorological Station

Total rainfall in millimetres for Birr													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
2009	124.8	15.6	49.3	106.1	69.8	-	-	-	-	-	-	-	381.4
2008	134.9	31.5	95.2	30.7	19.1	86.8	91.8	181.5	84.1	121.1	77	63.7	1017.4
Mean	76	53.9	60.7	52.8	61.2	55.6	58.7	78	70.6	84.1	74.2	78.3	804.2

Note Data for the most recent months are provisional. All means are for the period 1961-1990.

Table 12.2(b) Mean Monthly Rainfall Data for Mullingar Meteorological Station

Total rainfall in millimetres for Mullingar													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2009	104.6	-	40.6	102.9	75	-	-	-	-	-	-	-	-
2008	138.5	54.6	91.6	59.1	19.4	84.7	98.6	154.5	104.7	124	78.2	57.1	1065
mean	92.4	66.3	72.6	59	70.9	67	61.2	82.9	85.1	94.1	87.9	92.2	931.5

Note Data for the most recent months are provisional. All means are for the period 1961-1990.

Air Temperature

Air temperature for 2008 and 2009 to date, along with average daily air temperatures over the period 1961 - 1990 for Birr and Mullingar are presented in Table 12.3 (a) and Table 12.3 (b). The 2008 average daily temperatures for Birr and Mullingar ranged from 4.5°C in December to 15.4°C in August and 4.1°C in December to 14.9°C in August, respectively.

Table 12.3(a) Mean Air Temperatures at Birr Meteorological Station

Mean temperature in degrees C. for Birr													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2009	4.3	5.2	7.2	9	11.2	-	-	-	-	-	-	-	7.8
2008	6.4	5.9	5.9	7.7	13.3	13	15.2	15.4	12.3	8.9	7.2	4.5	9.6
mean	4.6	4.8	6.1	7.9	10.4	13.2	14.9	14.6	12.6	10.1	6.4	5.4	9.3

Note Data for the most recent months are provisional. All means are for the period 1961-1990.

Table 12.3(b) Mean Air Temperatures at Mullingar Meteorological Station

Mean temperature in degrees C. for Mullingar													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2009	3.5	4.9	6.5	8.7	10.8	-	-	-	-	-	-	-	7.5
2008	5.6	5.4	5.5	7.5	12.5	12.5	14.5	14.9	12	8.1	6.7	4.1	9.1
mean	4	4.2	5.7	7.6	10.1	13	14.7	14.2	12.3	9.7	5.9	4.8	8.8

Note Data for the most recent months are provisional. All means are for the period 1961-1990.

12.2.2 Existing Energy Usage in Ireland

Sustainable Energy Ireland (SEI's) 'Energy in Ireland 1990 -2006' report found that overall energy use in Ireland increased by almost 1% in 2006 while CO_2 related energy emissions increased by 0.4%.

Renewable energy use in Ireland grew by 15% during 2006. Wind energy experienced the highest growth in 2006, up by 46%, contributing 5% (primary energy equivalent) to Ireland's total energy requirements for 2006. The CO_2 emissions offset from renewable energy production reached 2.2 million tonnes of CO_2 in 2006.

Emissions associated with electricity generation in 2006 decreased by 1.8% notwithstanding growth of 6.3% in final electricity consumption. Last year each kWh of electricity emitted 601 grams of carbon dioxide which was a reduction of 5.6% on 2005.

The use of natural gas in electricity generation increased by 373 ktonne between 2005 and 2006.

At present, Ireland emits 14.85 Mtonnes of CO_2e from the Energy Sector, with emissions projected to increase by 1% over the period 2007 – 2020 to 15.0 Mtonnes of CO_2e.

12.2.3 Ireland and Climate Change

The potential effects of climate change on a global scale have been investigated by the Intergovernmental Panel on Climate Change (IPPC). The predicted impacts in Ireland are outlined in the National Climate Change Strategy including the following:

- Significant increases in winter rainfall;
- Lower summer rainfall (10% reduction in the southern half of the country);
- Prolonged water shortages and CO_2 losses from peat land due to water deficit;
- Benefits will include increased temperatures and related increases in agricultural production.

12.3 IMPACT ASSESSMENT

Given the nature of the proposed development, it is anticipated that the proposed development will not have a significant adverse impact on the local climate. Potential release of GHG emissions will occur during both the construction and operational phases.

12.3.1 Construction Phase

The main potential impacts on climate will be those associated with site traffic (HGV's and cars) entering and leaving the site. This will result in minor emissions of the greenhouse gas, CO_2 and acid gases, NO_x and SO_2. Levels of the pollutants emitted to atmosphere will be low, significantly lower than any regulatory standards, and therefore impact on climate will not be of any significance. With reference to Kyoto Protocol, which has set objectives to be achieved by 2008 – 2012, GHG emissions during construction will be negligible. There will be no ozone depleting substances used or emitted during the construction phase of the project.

12.3.2 Operational Phase

The proposed plant will have the capability of producing up to 350MW of power. The proposed development will operate as essentially one power block and will be capable of running in either open cycle or combined cycle modes. The proposed power block will comprises four small scale (<50MW) gas turbines, four heat recovery steam generators (HRSGs) and two steam turbine generators producing a further 75MW. Each HRSG will be fitted with supplementary gas burners and capable of producing around 32.5MWs of power at the alternator terminals. The principal design feature of the Lumcloon plant design is its flexibility and the fact that it will be capable of accommodating a wind power loss in the range from 47 to 185 MWs in open cycle mode and up to 70MW in supplementary firing mode.

In the combined cycle mode, a conditioned gas is combusted in the gas turbine generator producing electricity and the waste heat from the gas turbine is used to make steam to generate additional electricity via a Heat Recovery Steam Generator (HRSG) and a steam turbine. Combined Cycle Power Plants far exceed conventional Thermal Power Plants with efficiencies in a range of 54% to 57%. Open cycle gas turbines (OCGTs) are less efficient than combined cycle gas turbines (CCGTs) with typical efficiencies of approximately 37.5%. However, the advantage of operation in open cycle mode is that the plant can supply electricity in a much shorter timeframe than in combined cycle. In open cycle mode, the plant will be capable of producing 188MW of power.

12.3.2.1 CCGT & OCGT CO_2 Emissions

A document by the Oxford Institute for Energy Studies (20:20 vision to reducing CO_2 emissions in the UK electricity market) states that a modern CCGT plant only produces 40% of the CO_2 that a conventional coal-fired power station produces, and 75% of that produced by a conventional oil-fired power station, for the same amount of electricity output. Within the constraints of existing technologies it therefore appears that the only way to achieve a 20% reduction in emissions from electricity generation nationally would be to replace all conventional fossil fuel generation with low GHG emission CCGT plants and supported by renewable energy, and constrain demand growth to 1% per annum. At present, Ireland emits 14.85 Mtonnes of CO_2e from the Energy Sector, with emissions projected to increase by 1% over the period 2007 – 2020 to 15.0 Mtonnes of CO_2e.

Gas fired power generation station, as proposed in the Lumcloon plant, in both the open cycle and combined cycle modes have relatively low emissions of CO_2, CO and NO_x. From information provided by the project engineers, CO_2 emissions for the Lumcloon plant will be 200kgs/ MWhr minimum to 350kgs/MWhr maximum for the OCGT and 145kgs/ MWhr minimum to 280 kgs/MWhr maximum for the CCGT as opposed to coal and oil-fired thermal power plants with a CO_2 emission of 300 kgs/MWhr minimum to 1,000kgs/MWhr maximum.

At a maximum proposed output of 350MW, the combined cycle unit operating at full capacity for a year (circa 6,000 hours) at an average output of 212.5 kgs/MWhr CO_2 emissions would amount to 446,250 tonnes/annum. If the 188MW open cycle unit (peaking) operated at an expected circa 500 hours/year, at an average output of 275 kgs/MWhr CO_2 emissions would amount to 25,850 tonnes/annum. Therefore, this would amount to an approximate annual CO_2 output of 472,100 tonnes/annum, which is approximately 0.68% of Ireland's total GHG emissions in 2007 of 69.205 million tonnes carbon dioxide equivalent (Mt CO_2eq), , of which energy accounted for 21.5%.

When compared to a 350MW coal fired plant with an average CO_2 emission output of 341 kgs/MWhr running at the same operating capacity and producing 774,865 tonnes/annum, the proposed Lumcloon CCGT and OCGT plant will result in a CO_2 emissions reduction of approximately 302,765 tonnes CO_2/annum. When compared to a sample 350MW oil fired plant with an average CO_2 emission output of 265 kgs/MWhr running at the same operating capacity and producing 602,875 tonnes/annum, the proposed Lumcloon CCGT and OCGT plant will result in a CO_2 emissions reduction of approximately 130,775 tonnes CO_2/annum (Ref.: http://www.sei.ie/Publications/Statistics_Publications/Emission_Factors). Therefore, this surmises that the proposed Lumcloon Power Plant only produces 60% of the CO_2 that a conventional coal-fired power station produces, and 78% of that produced by a conventional oil-fired power station, for the same amount of electricity output.

It should also be noted that the January 2009 report entitled the '*Impacts of High Levels of Wind Penetration in 2020 on the Single Electricity Market'* published by CER and NIAUR concluded that a mixed portfolio of plant, i.e. CCGTs, OCGTs and wind, has a greater positive impact on CO_2 emissions than OCGTs and wind only.

The principal feature of the Lumcloon plant design is that it will be capable of supporting wind power generation plant by virtue of its design which lends itself to high efficiency, flexibility and availability. There are currently a number of wind farms in very close proximity to Lumcloon in Offaly and North Tipperary including the 2.55 MW Carrig wind farm, the 4.25 MW Skehanagh wind farm, the 2.55 MW Ballinleugh wind farm and the 2.55 MW Ballinveny wind farm. In their strategy document (*Grid 25)* for the Development of Ireland's Electricity Grid for a Sustainable and Competitive Future, Eirgrid predicts that the demand for electricity in the Midlands region will grow by over 40% by 2025 and the region is expected to have up to 160MW of wind energy capacity. As such, Eirgrid propose to invest an additional €310m in the midlands region upgrading the transmission network and new circuit build. Eirgrid state that this *'reinforcement is necessary to cater for the continued demand growth in the gateway towns of Athlone, Mullingar and Tullamore'*. Upgrading the network will also facilitate power flows from both conventional and renewable sources. The proposed plant at Lumcloon will provide a secure and reliable source of electricity and provide the necessary back up required for wind generation plants.

12.3.2.2 Traffic

Based on traffic figures detailed in the Traffic Impact Assessment report in Section 14.0, there will be an insignificant increase in greenhouse gases related to traffic on a local, regional or national scale.

12.4 MITIGATION MEASURES

In summary, the proposed development will adhere to the recommended mitigation measures as outlined in Section 11, Air Quality, and good site practices during the construction phase to ensure emissions of gases that may impact on the local, regional and global climate are minimised.

There will be no ozone depleting substances produced or emitted during the operational phase of the proposed development. Emissions of acidifying gases, such as nitrogen oxides and sulphur dioxide from the development will not have any significant adverse impact on the receiving environment as outlined in Section 11, Air Quality.

The EU is committed to an average reduction of greenhouse gas emissions by 8% below 1990 levels. The EU Emissions Trading Scheme (EU ETS) through Directive 2003/87/EC is being implemented to achieve this. As this plant will replace traditional coal, oil and peat power plants and support wind energy, it will therefore help Ireland to adhere to the EU GHG targets. The EPA has been given the responsibility for implementing the Emissions Trading Directive in Ireland by Government under the European Communities (Greenhouse Gas Emissions Trading) Regulations 2004 (S.I. 437 of 2004). The Lumcloon plant will operate under the EU ETS and will require a Greenhouse Gas Emissions Permit from the EPA.

12.5 RESIDUAL IMPACTS

Minimal residual impact is expected from the operation of the proposed development due to the comparatively low GHG emissions associated with CCGT & OCGT gas power generation in conjunction with supply support from local wind energy.

12.6 REFERENCES

- Environmental Protection Agency, 2000, Climate Change, Scenarios and Impacts for Ireland;
- 'National Climate Change Strategy' (Department of the Environment, 2000);
- EPA Report, 2005 Air Quality and Emissions to Air, Report 2003;
- EPA, 2003, Advice Notes on Current Practice (in the preparation of Environmental Impact Statements);
- Environmental Protection Agency Air Quality in Ireland 2007;
- Met Éireann website (http://www.met.ie/climate/);
- Oxford Institute for Energy Studies (20:20 vision to reducing CO_2 emissions from the UK electricity market).
- Sustainable Energy Ireland - http://www.sei.ie/Publications/Statistics_Publications/Emission_Factors

13.0 NOISE & VIBRATION

13.1 INTRODUCTION

This section of the Environmental Impact Statement evaluates and discusses the potential noise and vibration impact arising from the construction and operation of the proposed gas-fired power plant at Lumcloon, Co. Offaly. The assessment considered the existing noise environment, the predicted noise impact, possible noise mitigation and the residual impact of the proposed power plant.

13.2 METHODOLOGY

The methodology for the assessment and evaluation of the noise impact arising from the proposed power plant involved the following:

- Baseline Noise Survey – day and night time noise monitoring at three residential receivers in the vicinity of the proposed power plant. The purpose of the baseline noise monitoring survey was to evaluate the existing noise environment. Current noise sources and the background noise level have been evaluated during the noise survey.
- Development of a computational noise model to represent the proposed power plant and subsequently predict the noise impact at nearby residential receivers. Noise data for equipment and machinery to be used in the proposed power plant were input to the model to predict the noise levels at nearby residential receivers.
- Comparison of the predicted noise impact on residential receivers with the existing noise climate, the relevant EPA IPPC noise limits and the World Health Organisation (WHO) *Guidelines for Community Noise*. BS4142 *Method for Rating Industrial Noise affecting mixed residential and industrial areas (1997)* was also referenced.
- Recommendations for mitigation measures to minimise the noise impact on nearby sensitive receivers.
- Discussion of the residual noise impact on residential receivers after mitigation measures have been taken into account.

13.2.1 Noise Monitoring Methodology

All noise measurements were conducted according to the British Standard *BS 7445 Description and Measurement of Environmental Noise* and the EPA *Environmental Noise Survey Guidance Document.* The measurements were made using a Norsonic Nor140 Sound Level Meter which is a Type 1 meter according to IEC 651. The sound level meter was orientated towards the dominant noise source during all measurements at a height of 1.5m above ground level. A wind shield was used on the microphone throughout the survey and the sound level meter was calibrated before and after the noise survey. The Time Weighting used was Fast and the Frequency Weighting was A-weighted.

The primary measurement parameter recorded was the equivalent continuous A-Weighted sound pressure level, $L_{Aeq,\ T}$, during the daytime and nighttime monitoring periods. A statistical analysis of the measurement results was also completed so that the percentile levels $L_{A90,\ T}$ was also recorded. The percentile levels recorded represent the noise level in dB(A) exceeded for 90% of the measurement time, i.e. the background noise level.

Sound pressure levels were measured and recorded in 1/3rd octave bands from 6.3Hz to 20 KHz to establish the presence of tonal noise if any at each of the three monitoring locations. All noise sources were noted, recorded and where possible, identified during the course of the survey.

13.2.2 Noise Modelling Methodology

Noise predictions were made for the operational phase of the proposed power plant using Cadna_A Version 3.72 noise modelling software by DataKustik GmbH. The Cadna_A noise modelling software generates predicted noise levels for noise sensitive receivers in the vicinity of the proposed development. This noise prediction model incorporates appropriate noise calculation methodologies. The Cadna_A computational model develops a visual and mathematical representation of the predicted noise environment in the vicinity of the proposed development.

The proposed power plant was represented in the noise model and the resulting noise level at residential receivers was predicted. The ten most significant noise sources at the proposed power plant were implemented to the noise model and an appropriate sound insulation value for the proposed building elements was included. All buildings and natural screens were implemented to the model to maintain an accurate representation. The noise level was predicted at each of the three nearest residential receivers and the model was also used to identify the particular element at the plant site contributing most to the noise level at receivers.

In relation to the calibration and validation of the noise model, where a monitored and modelled noise level is within approximately +/- 3dB, the location can be deemed to be well validated in relation to monitored and modelled noise levels (i.e. a "Good" level of validation). WYG has validated the local noise climate in the noise model in terms of existing traffic noise levels versus the measured noise levels to a "Good" level of validation.

13.2.3 Noise Impact Assessment Criteria

An IPPC license as issued by the Environmental Protection Agency (EPA) will be required given the power generation capacity of the proposed power plant. According to the EPA document *Guidance Note for Noise in Relation to Scheduled Activities*, 2nd Edition 2006, the following noise limits are recommended:

- Daytime (8am to 10pm) – 55dB $L_{Ar,T}$ free field
- Night time (10pm to 8am) – 45 dB $L_{Aeq,T}$ free field

These noise limits are related to the recommended noise levels as outlined in the WHO *Guidelines for Community Noise*.

To assess the noise impact from the proposed power plant, guidance from BS4142 *Method for Rating Industrial Noise affecting mixed residential and industrial areas (1997)* is taken into account. According to BS4142:

> *Apply a 5dB correction if one or more of the following features occur, or are expected to be present for new or modified noise sources:*
>
> *- the noise contains a distinguishable, discrete, continuous note (whine, hiss, screech, hum, etc.);*

The proposed power plant will produce a "hum" noise. Noise that can be described as a hum or constitute a definable note can be defined as "tonal" in character. Noise which is tonal in character is defined in ISO 1996 *Description and measurement of environmental noise (1987)* as noise where the sound pressure level in any one 1/3rd octave band is 5dB above the sound pressure levels in each adjacent 1/3rd octave band. Therefore, the noise impact from the power plant has been rated according to the guidelines set out in BS4142 and as such, a 5dB correction has been added to the predicted noise level due to the power plant at each of the three residential receivers. This level is deemed the Rated Noise Level, $L_{Ar,T}$ and has been compared directly to the EPA defined limits as outlined above.

The likely future perceived impact of change in noise level at the noise sensitive properties adjacent to the proposed Lumcloon energy Ltd. development site has also been determined. In addition to the assessment of noise impact in accordance with the EPA document *Guidance Note for Noise in Relation to Scheduled Activities*, the perceived impact of change in noise level has also been reported for the noise sensitive properties. The perceived impact rating and the subjective response to changes in noise levels have been determined based on the subjective assessment of changes in noise levels, in terms of perceived change and loudness outlined in Table 13.1. The prediction of the perceived impact of change in traffic noise level may result in a noise sensitive property being classified as potentially suffering from a "no change", "negligible", "noticeable", "clearly noticeable", "substantial" or "very substantial" subjective change in noise level.

Table 13.1 Subjective assessment of changes in noise levels, in terms of perceived change and loudness.

Change in Noise Level	Impact Rating	EPA Glossary of Impacts	Subjective Reaction	Subjective Change
0	No change	n/a	n/a	No change
<3 dB(A)	Not Significant	Neutral, Imperceptible or Slight Impact	Barely perceptible	Negligible
3 – 5 dB(A)	Minor	Significant Impact: Positive or Negative	Perceptible	Noticeable
6 – 10 dB(A)	Moderate		Up to a doubling of loudness	Clearly Noticeable
11 – 15 dB(A)	Major		Over a doubling of loudness	Substantial
>15 dB(A)	Severe	Profound Significant Impact: Negative only	---	Very Substantial

Note Based on an extract from Morris, Peter and Therivel, Riki, Methods of Environmental Impact Assessment 2nd Edition, 2001.

13.3 RECEIVING ENVIRONMENT

13.3.1 Noise Monitoring Survey Results

An attended noise monitoring survey was carried out at the three closest residential receivers to the proposed development on the 4th and 5th of March 2009 during daytime and night time hours. Daytime noise monitoring was carried out over a period of 1 hour at each location. Nighttime noise monitoring was carried out over a period of 15 minutes at each location. The noise monitoring locations are shown on Figure 13.1. The noise levels recorded at each monitoring location during daytime and nighttime are displayed in Table 13.2 and Table 13.3. The L_{A90} is representative of the background noise level at each monitoring location. Weather conditions were clear, dry and cold when noise measurements were taken during daytime hours and night time hours. Measurements were taken between 6.3 Hz and 20 KHz. The normal maximum audible range is from 20 Hz to 20 KHz.

Table 13.2 Daytime Noise Monitoring Survey Results

Noise Sensitive Receiver	Measured Noise Level		Description of Noise Environment	Description of Location
	LAeq dB	LA90 dB		
NSR2	72.6	38.8	Predominant noise sources comprised approximately 60 cars, 3 vans, 2 tractors. No other significant noise sources.	Beside gateway to residence 3m off R357
NSR3	47.6	28.9	Predominant noise sources comprised dogs barking, bird song and 4 cars passed during measurement.	In garden of residence off R437 within 5m of front façade of house

Note: Daytime noise levels at NSR1 not recorded due to technical fault. The daytime noise levels recorded at NSR 2 are representative of the daytime noise levels at NSR1 as the noise levels at both locations are dominated by road traffic on the R357.

Table 13.3 Nighttime Noise Monitoring Survey Results

Noise Sensitive Receiver	Measured Noise Level		Description of Noise Environment	Description of Location
	LAeq dB	LA90 dB		
NSR1	63.4	18.8	The only significant noise source included 8 cars passing during the measurement.	Within 3m of front façade of house off R357
NSR2	60.8	21.0	The only significant noise source included 8 cars and 1 van passing during the measurement.	Beside gateway to residence 3m off R357
NSR3	37.2	25.2	Audible noise comprised very distant cars travelling on R357, no noise in immediate area.	In garden of residence off R437 within 5m of front façade of house

13.3.2 Description of the Noise Environment

The existing noise environment in the vicinity of the proposed site was observed to be typical to that of a rural area. The predominant noise sources noted were road traffic along the R357 and R437. Other noted noise sources included birdsong and agricultural activity. Previously, there was an ESB power plant on the site of the proposed development. Typically this would have resulted in an audible hum at each of the three receivers. As with any power plant, this audible hum would contribute to the background noise environment in an area.

13.4 IMPACT ASSESSMENT

13.4.1 Construction Phase

13.4.1.1 Construction Noise

Construction activity will include the operation of large machinery such as earth movers, bulldozers, trucks, cranes, steel work assembly and fixing. In order to minimise the potential for a construction noise impact on the three nearby residential receivers, the noise limits outlined in Table 13.4 should be adhered to during the construction of the proposed development. In order to limit disturbance from construction noise, it is recommended that construction noise be assessed and managed in accordance with BS5228 *Noise Control on Construction and Open Sites*. No national construction noise limits are referencable. Therefore, it is recommended that the construction noise limits outlined by The National

Roads Authority in its "Guidelines for the Treatment of Noise and Vibration in National Roads Schemes" should be adhered to at the three nearby residential receivers during construction..

Table 13.4 Maximum Permissible Noise Levels at the Façade of Dwellings during Construction (NRA Guidelines, October 2004)

Days & Times	LAeq (1hr) dB	LAMax dB
Monday to Friday - 07.00 to 19.00	70	80[Note1]
Monday to Friday - 19.00 to 22.00	60[Note1]	65[Note1]
Saturday - 08.00 to 16.30	65	75
Sundays and Bank Holidays - 08.00 to 16.30	60*	65*

Note 1 Construction activity at these times, other than that required in respect of emergency works, will normally require the explicit permission of the relevant local authority.

13.4.1.2 Construction Traffic

During construction, there will be approximately 30 HGV movements per day. Construction site employee traffic volumes will result in approximately 400 vehicle movements per day assuming a vehicle occupancy of two. Existing AM and PM peak hour flows on the R357 are in the order of approximately 200 to 220 vehicle movements per day. Therefore, as a doubling of road traffic volume results in an approximate 3 dB increase in noise level at adjacent properties, the noise impact from traffic during the construction phase will be negligible.

13.4.1.3 Construction Vibration

The nearest residential receiver to the proposed power station is approximately 400m away with the other two receivers located approximately 600m away. Therefore, a vibration impact during construction is most unlikely to occur. However, if in the unlikely event that complaints related to vibration impact are received from nearby residential receivers, vibration monitoring will be carried out at existing properties in the vicinity of the proposed development site during the construction phase.

If there is a requirement to undertake vibration monitoring, the following guidance on vibration monitoring (monitoring of peak particle velocity) should be followed;

- The instrumentation should monitor three orthogonal components of peak particle velocity (p.p.v) and the trigger values / limits are set based on the maximum of these (the peak component particle velocity) as follows:

- Amber level = 7.5 mm/s (Operatives should be notified if this level is reached; work may continue but with caution – review of working method should be considered).
- Red level = 10 mm/s: work should be stopped if this level is reached and working method reviewed; revised method of working to be agreed prior to works proceeding again; Site Foreman & Operatives to be notified immediately.
- Visible & audible alarms should form part of the monitoring system so that it is easily established when the trigger / alarm levels are reached.

13.4.2 Operational Phase

As stated above, the noise generated by a power station is perceived as a constant "hum" due to the cyclic nature of the machinery used. The noise impact on the nearby residential receivers from the proposed development was determined and where noise mitigation is required this has been recommended and input into the noise model. All major noise sources proposed for use at the power station are included in the noise model to determine the noise level at nearby residential receivers. The most significant noise source types only were taken into account as any noise source of less significance will result in a negligible difference in the overall noise level at any of the nearest residential receivers.

There will be no expected vibration sources from the operation of the proposed development.

All sound power levels shown above were provided to WYG by Lumcloon Energy Ltd. There was no available sound power data for the Air Cooled Condenser Fans (ACC Fans) when the noise impact assessment was carried out. Therefore a realistic sound power level of 100dB L_w per ACC Fan was input into the noise model.

Table 13.5 Sound Power Levels for the Nine Most Significant Noise Sources

Plant Item	Source Type	Source Location	Sound Power Lw dB	Number	Height
Bypass stack	Point	On roof of open cycle power building	115	4	4.0
Closed Cooling	Point	Inside power generation building	99	2	4.0
Enclosed Ventilation Inlet GT	Point	On roof of open cycle power building	90	4	19.6
Enclosed Ventilation Outlet GT	Point	On roof of open cycle power building	89	4	14.0
GT Air Intake	Point	On roof of open cycle power building	94	4	26.4
HRSG Stack	Point	On HRSG building roof	99	4	43.0
Transformer	Point	Outside, at side of open cycle power hall	86	6	4.0
ACC Fans	Point	Outside between power generation building and diesel storage bund	100	18	15.0
Gas & Steam Turbine	Point	In power generation building	98	2	8

The sound pressure levels predicted to arise due to the operation of the proposed Lumcloon Energy Ltd. power plant are as outlined in Table 13.6.

Table 13.6 Predicted Noise Levels at Residential Receivers due to Operation of Plant

Receiver	Predicted Noise Level L_{Aeq} dB	Rated Noise Level (+5dB) $L_{AR'T}$ dB
NSR1	38.6	43.6
NSR2	37.3	42.3
NSR3	38.9	43.9

The highest noise level as a result of the operation of the proposed power station has been predicted to be 39dB L_{Aeq} at NSR 1 and NSR 3. When expressed as a rated noise level, this equates to approximately 44dB L_{AR} at NSR 1 and NSR 3. The operation of the proposed power plant will result in higher background noise levels at the nearest residential receivers as the power plant will operate on a 24/7 basis.

As stated above, an IPPC license will need to be issued by the Environmental Protection Agency (EPA) for the proposed development to operate. On the basis of the predicted noise levels at the surrounding receiver locations, the EPA noise limits of 55dB $L_{Ar,T}$ during daytime (8am to 10pm) and 45 dB $L_{Aeq,\,T}$ during night time (10pm to 8am) will be achieved.

Although the predicted noise levels are not in excess of the specified guideline values at the nearest noise sensitive receiver locations, the perceived impact of the proposed development on the nearby noise sensitive receivers has also been assessed in accordance with the criteria outlined in Table 13.2. For the assessment of perceived impact on the nearest residential receivers the predicted noise levels due to the proposed power plant have been compared with the existing background noise levels in the area, i.e. the measured L_{A90} noise levels. Therefore, the modelling results indicate negligible subjective change in perceived noise levels during daytime at NSR1 and NSR2, i.e. along the R357. At NSR3 during the daytime, there will be an increase of approximately 10dB which constitutes a clearly noticeable subjective change in perceived noise levels. In comparison to the measured background nighttime noise levels, the increase in predicted noise levels during nighttime will result in a substantial to very substantial increase in perceived noise level at the nearest noise sensitive receiver locations. However, as stated above, the EPA IPPC noise limits will not be exceeded which are based on the World Heath Organisation (WHO) *Guidelines on Community Noise*.

The WHO Guidelines on Community Noise state that '*To protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB L_{Aeq} for a steady, continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB L_{Aeq}. These values are based on annoyance studies, but most countries in Europe have adopted 40 dB L_{Aeq} as the maximum allowable level for new developments (Gottlob 1995). Indeed, the lower value should be considered the maximum allowable sound pressure level for all new developments whenever feasible. At night, sound pressure levels at the outside façades of the living spaces should not exceed 45 dB L_{Aeq} and 60 dB L_{Amax}, so that people may sleep with bedroom windows open. These values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15 dB*'. The proposed development will achieve the WHO recommended noise levels.

Site traffic due to employees entering and leaving the site will give rise to a less than 20% increase in traffic flows and therefore, an insignificant traffic noise impact in the vicinity of the proposed development site. Table 13.7 outlines the proposed traffic flows that the development will generate. The increase in traffic flow along local routes can be considered negligible in terms of a road traffic noise impact on nearby sensitive receivers.

Table 13.7 Generated Traffic for the Operational Phase of the proposed development

Location	Existing AM Peak	Existing PM Peak	Total Vehicle Movements – Operational Phase
R357 and R437 staggered crossroads	227	235	21
Local Road T-junction onto R357	190	208	21
R357 at Proposed Junction	189	203	30

13.5 MITIGATION MEASURES

This section details the proposed methodology by which potential impacts resulting from the proposed power plant development during the construction and operational phases may be mitigated.

13.5.1 Construction Phase Mitigation Measures

General guidelines for limiting the potential noise impact during the construction phase of the proposed power plant are outlined below:

- Limit noisy construction works to 8am to 6pm weekdays with Saturday working from 8am to 1pm (relatively quiet construction activities could be carried out outside these hours, subject to strict controls).
- Use modern, silenced and well-maintained equipment conforming to EU directives.
- Shut down equipment when not in use, where practicable.
- Maintain site semi-static equipment such as generators, mixers, and compressors as far away as possible from sensitive locations and ensure that the orientation is the optimum for low noise.
- Utilise buildings under construction as screening between the construction site and residential receivers, where possible.
- Ensure that all workers are given training with respect to minimising noise and disturbance.
- Consider quieter working methods; for example use vibratory-driven piles instead of impact driven piles.
- Design of haul routes within the site to ensure maximum distance from noise sensitive locations.

- The utilisation of localised acoustic screening should be provided for specific fixed location items of plant throughout the site. Items such as generators, pumps and compressors should be provided with localised screening in the form of a noise barrier or actual enclosure to reduce noise emissions.
- Maintain ongoing contact with local residents to ensure any complaints relating to construction phase noise for the project from local residents can be addressed. Also, prior to any particularly noisy activities, local residents should be contacted in order to minimise the perceived noise impact.
- WYG recommend that the Construction Management Plan for the project is inclusive of a recommendation for a suitably qualified construction noise expert to visit the site on a regular basis and carry out an audit of site work practices in order to ensure that every effort is made to reduce noise breakout from site. This should be inclusive of noise monitoring at appropriate agreed and repeatable locations. WYG recommends that the three nearby residential receivers as previously identified in this report be considered as *'Construction Noise Monitoring Locations'*.

13.5.2 Operational Phase Mitigation Measures

13.5.2.1 Building Envelope

The predicted noise levels at the three residential receivers as detailed above are based on a specific transmission loss performance for the cladding and roof elements of buildings housing high noise generating power plant equipment. In order to achieve the predicted values set out above and meet the previously discussed EPA noise limits for this facility, the sound insulation values for building elements outlined in Table 13.8 are required of the cladding and roof systems used in the power plant building envelopes. The sound transmission loss coefficients assumed for the CCGT and OCGT areas of the power plant building assume an average absorption coefficient of 0.25 at 500Hz.

Table 13.8 Assumed Transmission Loss Octave Band Values for Power Plant Buildings

Building Element	Octave Spectrum (dB)									
	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	Rw
Combined Cycle Building	7	13	19	25	31	38	38	38	38	35
Open Cycle Building	10	16	22	28	34	41	41	41	41	38

13.5.2.2 Power Plant Equipment Isolation

Due to the noise levels generated by the gas and steam turbine / generator in particular, it is recommended that all major plant items are sufficiently isolation mounted to minimise noise transmission through to the building structure and the concrete floor. The vibration isolation employed must be specifically selected to suit the weight, frequency of oscillation and isolation efficiency of the plant item being considered. Otherwise, if noise is transmitted to the structure, the building envelop itself will become vibration excited and as a result emit excessive noise into the surrounding environment.

13.6 RESIDUAL IMPACTS

The closest residential receiver to the power station is approximately 400m away with two residential receivers located approximately 600m away. The distance of the proposed power plant from the nearest residential receivers allows for significant noise attenuation due to distance. When all major noise sources on the proposed site were modelled, it was found that the noise impact at the three residential receivers is predicted to be below the EPA noise limits of 55dB $L_{Ar,T}$ during daytime (8am to 10pm) and 45 dB $L_{Aeq,T}$ during night time (10pm to 8am). As the power station will be operation on a 24 hour basis, the night time scenario defines the actual noise limit on the power station. It is concluded that the noise impact due to the power station will not result in an exceedance of the relevant EPA limit values and the recommended daytime and nighttime noise levels in the World Health Organisation (WHO) *Guidelines for Community Noise*.

13.7 REFERENCES

- Guidelines for Community Noise
- World Health Organisation (WHO): 2000
- Method for Rating Industrial Noise affecting mixed residential and industrial areas
- BS4142: 1997
- Environmental Noise Survey Guidance Document
- Environmental Protection Agency (2003)
- ISO 1996 Acoustics – Description and Measurement of Environmental Noise – Part 1 & 2

- International Standards Organisation
- BS7445: Description and measurement of Environmental Noise – Part 1 & 2
- British Standard (2003)

14.0 ROADS AND TRAFFIC

14.1 INTRODUCTION

This chapter assesses the potential impact on roads and traffic caused by the proposed development of the Gas Fired Power Plant at Lumcloon, Ferbane, Co. Offaly. The chapter assesses the impact of the proposed development on the local road network during construction of the development, in the opening year of the development (assumed to be 2012) and in the design year for the development, chosen as 15 years after the opening of the power plant. The capacity of the proposed new junction onto the R357 is also assessed.

The scope of the traffic impact assessment was discussed with Offaly County Council Roads Department and the methodology was agreed. As the proposed development does not directly access a National Road, the National Roads Authority (NRA) did not have any comment to make regarding the traffic assessment. Furthermore, a Stage 1 Road Safety Audit has been carried out for the proposed development to assess Road Safety Measures and can be found in the Appendix 14.1.

The proposed development site is approximately 11 acres and located adjacent to the R357. The site is about 5km south of Ferbane, 22km south of Athlone, 20km west of Tullamore and 15km north of Birr. The site is a brownfield site and housed the former ESB owned peat fire power station that ceased operations in 2001 and was decommissioned in 2004. Access to the proposed site will be via a proposed simple priority junction off the R357.

14.2 METHODOLOGY

The proposed junction for the development was tested for capacity with determined flows for the existing situation, the year that construction begins, the year of opening and for the design year. The existing adjacent junctions were also tested for capacity with and without development traffic for construction year traffic, opening year traffic and design year traffic. The changes in capacity ratio at the junctions enable us to define impacts on the existing road network.

The contents of this analysis are based on the recommendations of the NRA 'Traffic & Transport Assessment Guidelines' as well as the 'Traffic Management Guidelines' as published by the Stationery Office.

14.3 EXISTING ROAD TRAFFIC ASSESSMENT

14.3.1 Existing Traffic Patterns

To establish a *'baseline'* for this assessment, a 12-hour traffic count was undertaken at two junction locations adjacent to the proposed site. The first location was at the staggered crossroads junction of the R357 and the R437, west of the proposed site entrance. The second location was at a simple priority t-junction between a local road that borders the site to the west and the R357. The morning peak was identified to be 08:00-09:00 Hrs and the evening peak was 17:00-18:00 Hrs. The 12 Hour counts (refer to Figure A.1 contained in Appendix B to the Traffic Impact Assessment Report, which is attached as Appendix 14.2 to the EIS) have been converted to Average Annual Daily Traffic (AADT) using RT201 expansion factors for 'Rural Intertown Routes' and are shown in Table 14.1 below.

Table 14.1 Average Annual Daily Traffic Numbers

Road	AADT
R357 (west)	2052
R357 (east)	2091
R437 (north)	593
R437 (south)	545
Local Road	138

14.3.2 R357 Adjacent to the Proposed Development

The R357 at the location of the proposed development is approximately 6m wide. There are no pedestrian facilities or public lighting at the location of the proposed development due to the rural nature of the location. The road is subject to an 80kph speed limit with straight horizontal and vertical profiles. The road surface in the vicinity of the site is in good condition with a broken white line along the centreline. The adjacent lands bounding onto the R357 are agricultural in nature.

14.3.3 Collision Analysis

From analysing the Road Safety Authority Collision Database from 1996 to 2007, there were five minor collisions on the R357 and one serious collision within a 1km radius of the proposed site. The collisions occurred near Lumcloon Cross roads, approximately 1.7km west of the proposed site entrance.

14.4 PROPOSED DEVELOPMENT

14.4.1 Introduction to the Development

The proposed development consists of a 350 MW gas fired power plant. The site will be accessed by construction traffic and after opening, by the power plant staff, through a simple T-junction connected to the R357.

14.4.2 Site Operation and Trip Generation

Usually a TRICS (Trip rate Information Computer System) assessment is carried out for proposed development to determine the development generated traffic. However due to the specialised nature of the project it is not feasible to use TRCIS and therefore the information has been provided by the client/design team. For the construction phase of the project it is proposed to have a peak of 400 construction staff on site at any one time. In order to calculate the number of morning and evening trips generated by construction staff, a vehicle occupancy of two was deemed reasonable for a construction site. This assumption results in 200 trips being generated by the construction of the proposed development. It is further assumed that the 200 trips generated will occur during the peak hours. During the morning peak all 200 trips generated enter the site and during the evening peak all 200 trips generated leave the site. There will be a number of HGV deliveries (approximately 15 No.) to site during the course of the working day however it will be assumed that these deliveries will be spread out and not coincide with the peak hours.

For the opening and design year, generated trips have been chosen based on the number of staff at the plant. It is envisaged that 15 staff will operate and maintain the power plant day on a shift basis (3 eight hour shifts). For the purposes of analysis, a vehicle occupancy of one was chosen and it has been assumed that shifts will end and start during the AM and PM peak hours. This results in a generation of 15 vehicles entering and 15 vehicles leaving the proposed development during peak hours.

14.4.3 Traffic Generation

Assessment has been made of the likely affects of development on the capacity of adjacent junctions and of the R357 at the location of the proposed junction from the development.

Both traffic generated during construction and operation of the plant have been assessed. Volumes of generated traffic were based on proposed construction staff figures of 400 and proposed operational and maintenance staff figures of 15. A vehicle occupancy of 2 was assumed for the construction phase and a vehicle occupancy of 1 was assumed after opening. It was further assumed that all construction traffic would arrive during the morning peak hour and leave during the evening peak hour. Likewise, it was assumed that shifts would start and end during the peak hour resulting in 15 trips to the development and 15 trips from the development during peak. Predictions on traffic distribution are made based on existing traffic patterns, local knowledge and population information. Total traffic generated across each of the junctions is the same for AM and PM although directional splits differ. Table 14.2 shows the calculated traffic generated during construction and operational phases of the development across each junction.

Table 14.2 Development Generated Traffic for Construction & Operation Phases

Location	Development Generated Traffic			
	AM In	AM Out	PM In	PM Out
2009 (Construction)	200	15	0	200
2012 (Operational)	15	15	15	15
2027 (Operational)	15	15	15	15

14.4.4 Development Generated Traffic Distribution

It is difficult to predict precisely where vehicles will be attracted from. The key operators of the development will usually define any trends relating to distribution. Traffic distribution from a new development is always subjective. Predictions on traffic behaviour are made based on existing traffic patterns, local knowledge and population information.

For the Traffic Impact Assessment, it is proposed to use the following distribution patterns for the traffic generated by the proposed development:

- It will be assumed that 30% of the generated traffic leaving the development will turn right out of the proposed development and travel towards Tullamore.
- It will be assumed that 70% of the generated traffic leaving the development will turn left towards the staggered cross-roads without turning left down the adjacent local road.
- At the crossroads it will be assumed that 30% of the total traffic generated will turn right in the direction of Ferbane and Athlone, 30% will turn left in the direction of Kilcormac and Birr and 10% will travel straight through the cross-roads.
- The same proportional splits will be used for the generated traffic entering the development.

14.4.5 Traffic Growth

The Traffic Impact Assessment will assess the impacts of the proposed development for the opening year traffic volumes. For the purposes of this report it is assumed that the opening year will be 2012. The report will also assess the likely impacts in the 'Design Year' which is usually taken as 15 Years after opening. For this reason it is necessary to expand the current year traffic volumes to 2012 and 2026 values. The traffic growth predictions in the *'National Road Authority Future Traffic Forecasts 2002-2040'* for 'national primary roads' are used for this purpose. A factor of 1.07 was calculated to convert 2009 traffic flows into 2012 traffic flows and a factor of 1.33 was calculated to convert the 2009 traffic flows into 2027 traffic flows. These factors will be used to determine the peak hour movements for the opening year and the design year of 2027. Traffic growths will be applied to existing traffic patterns to model the opening year 2012 and the design year 2027. Growths are not normally applied to developments of fixed capacity. It is not the intention to apply growth factors to this development generated traffic.

Figures A.2 to A.7, contained in Appendix B to the Traffic Impact Assessment Report (refer to Appendix 14.2 of the EIS), show the traffic growth for the junctions with and without the proposed development generated traffic in place.

14.5 TRAFFIC ASSESSMENT

14.5.1 Peak Hour Flows

To assess the capacity of the junctions and the impact likely to be generated by the proposed development, the software package PICADY was used. The junction capacities for 2009, 2012 and 2027 with and without the development generated traffic have been used to determine the ratio of demand flow to capacity (RFC) for each arm of each junction. An RFC of 0.75 or less is desirable in rural areas, and 0.85 in urban areas, for a junction to be working efficiently.

14.5.2 Effect of Generated Traffic on R357/R437 Staggered Junction

The critical cases of the AM and PM peak flows for the staggered junction of the R357 and R437 for all scenarios have been assessed in PICADY. A detailed breakdown of the flows used in the analysis and how they were derived can be found in Appendix 14.2 of the EIS (Appendix B of the Traffic Impact Assessment Report). The results of the analysis are indicated in Table 14.3 below.

Table 14.3 R357/R437 Staggered Junction

Junction	AM Peak Max RFC	PM Peak Max RFC
2009 Peak	0.06	0.05
2009 Peak with Construction Traffic	0.17	0.15
2012 Peak Without Proposed Development	0.06	0.05
2012 Peak With Proposed Development	0.07	0.06
2027 Peak Without Proposed Development	0.08	0.06
2027 Peak With Proposed Development	0.09	0.07

As can be seen from the Table 14.3, the RFC levels for the junction are well below the 0.75 threshold. The maximum RFC of 0.17 occurs during construction phase in 2009 on the northern arm of the R437. This indicates that the junction will operate well within its capacity during construction, in the opening year of the development with the development in place and in the design year.

14.5.3 Effect of Generated Traffic on Adjacent R357 T-Junction

The critical cases of the AM and PM peak flows for the T-junction of the local road adjacent to the development onto the R357 have been assessed for all scenarios in PICADY. A detailed breakdown of the flows used in the analysis and how they were derived can be found in Appendix C of the Traffic Impact Assessment Report (refer to Appendix 14.2 of the EIS). The results of the analysis are indicated in Table 14.4 below.

Table 14.4 Adjacent R357 T-Junction

Junction	AM Peak Max RFC	PM Peak Max RFC
2009 Peak	0.01	0.02
2009 Peak with Construction Traffic	0.01	0.02
2012 Peak Without Proposed Development	0.01	0.02
2012 Peak With Proposed Development	0.01	0.02
2027 Peak Without Proposed Development	0.01	0.02
2027 Peak With Proposed Development	0.01	0.02

As can be seen from the Table 14.4, the RFC levels for the junction are well below the 0.75 threshold. The maximum RFC of 0.02 occurs in the PM during the design year on the existing local road arm of the junction. This indicates that the junction will operate well within its capacity during construction, in the opening year of the development with the development in place and in the design year of the development.

14.5.4 Effect of Generated Traffic on Proposed R357 T-Junction

The critical cases of the AM and PM peak flows for the proposed T-junction from the development onto the R357 have been assessed for all scenarios in PICADY. The results of the analysis are indicated in Table 14.5 below.

Table 14.5 Proposed R357 T-Junction

Junction	AM Peak Max RFC	PM Peak Max RFC
2009 Peak with Construction Traffic	0.25	0.27
2012 Peak With Proposed Development	0.02	0.02
2027 Peak With Proposed Development	0.02	0.02

As can be seen from the Table 14.5, the RFC levels for the junction are well below the 0.75 threshold. The maximum RFC of 0.27 occurs in the PM during the construction phase on the proposed T-junction arm. This indicates that the proposed junction will operate well within its capacity during construction, in the opening year of the development with the development in place and in the design year of the development.

14.5.5 Effect upon the R357

In 2009 with construction ongoing the total two-way flow on the R357 in the vicinity of the proposed development in the PM Peak Hour (larger flow) is 343 vehicles. In the design year, 2027, the total two-way flow is 291 vehicles.

The capacity of this road is tested in accordance with RT180 *'Geometric Design Guidelines'*. In accordance with RT180 a 6m wide road with 0% sight distance greater than 460m with Level of Service C will have a two-way capacity of 600 vehicles per hour. The same road with a Level of Service D will have a two-way capacity of 1075 vehicles per hour. The R357, thus, has adequate capacity for the base plus development generated traffic in 2009 during construction and in the design year, 2027.

The natural growth in traffic (66 vehicles) exceeds the operational development generated traffic (30 vehicles) therefore any deterioration of the surface will be more attributable to the natural growth of traffic. However the construction related traffic will far exceed the natural growth in traffic over the same period. During scoping discussions with Offaly County Council Roads Department, the Council expressed concerns about the possible effect of construction generated traffic on the R357. It was agreed, subject to a successful planning application decision, that prior to construction commencing a structural evaluation be carried out on the

R357. Any defects that arise due to construction traffic will have to be remedied to the satisfaction of Offaly County Council Roads Department.

14.6 VULNERABLE ROAD USERS

Given the rural site location and the type of development it would be expected that the proposed development would not generate a pedestrian demand. Car parking will be provided within the boundary of the proposed development to cater for both the construction phase and the operational phase. Drop kerbing and tactile paving will be provided internally at the operational phase at all crossing points to provide for safe access/egress for staff with reduced mobility.

14.7 ROAD SAFETY MEASURES

A Stage 1 Road Safety Audit has been carried out for the proposed development. It is recommended that a Stage 2 RSA and a Stage 3 RSA are carried out at detailed design stage and prior to opening respectively. Furthermore, a construction traffic management plan should be carried out by the contractor prior to construction to identify possible traffic routes and mitigation measures.

14.8 CONCLUSIONS

The Construction phase of the development will have the largest impact on the R357 in terms of traffic flows; however it will be of a short term nature. The operational phase impacts are much smaller. Both scenarios result in total traffic volumes much less than the capacity of the existing R357.

Analysis was carried out on the proposed development junction with the development in place. It was found to have adequate reserve capacity when tested for the critical cases of the morning and evening peaks during construction, in the opening year and in the Design Year.

This existing R357/R437 staggered junction when tested without the development was found to be operating efficiently. The junction has spare capacity for the natural growth of traffic as well as the development generated traffic for all scenarios.

The existing local road T-Junction with the R357 is shown to have more than adequate spare capacity in the design year with all developments in place.

15.0 CULTURAL HERITAGE

This chapter of the EIS consists of an assessment of the potential impacts of the proposed development on the archaeological and cultural heritage and architectural heritage. The Chapter is sectioned into two parts:

- Archaeological and Cultural Heritage – Section 15.1
- Architectural Heritage – Section 15.2

This assessment includes a desktop study, description of the receiving environment and an assessment of the potential impact on the receiving environment. Measures to mitigate the likely significant impacts of the proposed development are also provided, where appropriate.

The proposed development site is located in the townland of Lumcloon, in the civil parish of Gallen and the barony of Garrycastle, Co. Offaly. The site is located adjacent to the R357 and approximately 5km south of Ferbane, 22km south of Athlone and 20km west of Tullamore.

15.1 ARCHAEOLOGICAL AND CULTURAL HERITAGE

15.1.1 Introduction

The potential inputs of the proposed development on Archaeological & Cultural Heritage are addressed in this section of the EIS. The following report comprises the results of a desk top study and field survey of the land on which the development is planned.

15.1.2 Methodology

15.1.2.1 Introduction

For the purpose of setting the proposed development within its wider archaeological and cultural heritage landscape, and to assess the archaeological potential of the site, a comprehensive desk top study of available archaeological, historical and cartographic sources was undertaken. A study area of c. 1.5km from the proposed development site was applied. The townlands located within this study area are Bun, Derrycarney, Falsk, Lumcloon and Rin.

15.1.2.2 Record of Monuments and Places

The Record of Monuments and Places (RMP) is compiled by the Archaeological Survey of Ireland (ASI) and comprises lists and maps of monuments known to the National Monuments Service. Monuments recorded in the Record of Monuments and Places are protected under the National Monuments Acts 1930 to 2004. The information contained within the RMP is derived from the earlier non-statutory Sites and Monuments Record (SMR); some entries, however, were not transferred to the statutory record, as they do not fall within the strict criteria for inclusion within the RMP; some, for instance, could not be located with sufficient accuracy. Such sites however remain part of the SMR. The record is a dynamic one and is updated so as to take account of on-going research. The relevant files for these sites contain details of documentary sources and aerial photographs, early maps, OS memoirs, the field notes of the Archaeological Survey of Ireland and other relevant publications. A study area of c. 1.5km from the proposed development was taken; there are no RMP or SMR sites recorded within that area.

15.1.2.3 List of Monuments in State Ownership or Guardianship

National Monuments may be acquired by the Minister for the Environment, Heritage and Local Government whether by agreement or by compulsory order. The State or Local Authority may assume guardianship of any National Monument (other than dwellings). The owners of national monuments (other than dwellings) may also appoint the Minister for the Environment, Heritage and Local Government or the Local Authority as guardian of that monument if the State or Local Authority agrees. Once the site is in the ownership or guardianship of the State it may not be interfered with without the written consent of the Minister. There are no monuments within State Ownership of Guardianship within the study area.

15.1.2.4 Register of Historic Monuments

Section 5 of the 1987 National Monuments Act states that the Minister for the Environment, Heritage and Local Government is required to establish and maintain a Register of Historic Monuments. Historic monuments and archaeological areas present on the register are afforded statutory protection under the 1987 Act. Any interference with sites recorded in the Register without the permission of the Minister is illegal, and two months notice in writing is required prior to any work being undertaken on or in the vicinity of a registered monument.

This list was largely replaced by the Record of Monuments and Places following the 1994 Amendment Act. There are no Registered Historic Monuments within the study area.

15.1.2.5 List of Preservation Orders

Sites deemed to be in danger of damage or destruction can be allocated Preservation Orders under the 1930 National Monuments Act making any interference to the site illegal. Temporary Preservation Orders can be attached under the 1954 Act. These perform the same function as a Preservation Order but have a time limit of six months, after which the circumstances must be reviewed. Work may only be undertaken on or in the vicinity of sites under Preservation Orders with written consent and at the discretion of, the Minister for the Environment, Heritage and Local Government. There are no monuments under Preservation Order within the study area.

15.1.2.6 Offaly County Development Plan 2009 – 2015

The relevant sections of the Offaly County Development Plan 2009 - 2015 (Offaly County Council) were reviewed to highlight potential areas of concern regarding archaeological and cultural heritage.

15.1.2.7 Cartographic Sources

Reference to cartographic sources is important in tracing land use development within the area as well as providing important topographical information on sites and areas of archaeological potential. Primary cartographic sources consulted included the Ordnance Survey 6" maps, first and later editions (T.C.D. Map Library), William Larkin's A Map of the Bogs of Allen within the Kings County in Ireland (1809) and John Longfield's map of this area for the Bogs Commissioners (1810), both of which are reproduced in Arnold Horner's Mapping Offaly in the early 19th century (Horner 2006).

15.1.2.8 Recorded Archaeological Finds

The topographical files in the National Museum of Ireland were consulted to determine if any archaeological artefacts had been recorded from the area. This is the national archive of all known finds recorded by the National Museum. It relates primarily to artefact, but also includes references to monuments and has a unique archive of records of previous excavations. Other published catalogues of prehistoric material were also studied including; Raftery (1983 - Iron Age antiquities), Eogan (1965; 1993; 1994 - bronze swords, Bronze Age hoards and goldwork), Harbison (1968; 1969a; 1969b - bronze axes, halberds and daggers) and the Irish Stone Axe Project Database (Archaeology Dept., U.C.D.). All townlands within the study area were assessed; finds are recorded from Lumcloon and Falsk (see Appendix 15.1.1).

15.1.2.9 Historical Research

Historical sources consulted included the British and Irish Archaeological Bibliography (www.biab.ac.uk), Lewis Topographical Dictionary (1837), A Census of Ireland circa 1659 (Pender 1939), Offaly: History and Society (Nolan & O'Neill 1998) and local archaeological and historical journals such as Offaly heritage : journal of the Offaly Historical & Archaeological Society.

15.1.2.10 Previous Excavations

The excavation bulletin website (www.excavations.ie) was consulted to identify previous excavations that may have been carried out within the study area. This database contains summary accounts of excavations carried out in Ireland from 1970 to 2005. Details of previous excavations are listed in Appendix 15.1.2.

15.1.3 Baseline Findings

15.1.3.1 Early History of the Lumcloon Area

The area around Lumcloon has a long history of human activity. Just 2km to the southeast of the proposed development site is located the habitation site at Lough Boora (RMP OF023-005), the only Early Mesolithic site identified to date from Ireland's midlands. The site dates from a period before the formation of the raised bog in this area. At that time the site was located on the shores of a large post-glacial lake and evidence from excavations suggests that hunter-gatherers were using fireplaces, working chert, shale and limestone and trapping pig, hare, birds, eels and trout in the area around the site (O'Sullivan 2007, 159). The area was subsequently covered by peat which masked the post-glacial topography and archaeological remains. Given that the extensive peatlands in Offaly were in the process of forming in the early prehistoric period it can be argued that sites of a similar nature remain to be identified (McDermot 1998, 11).

This area continued to be used through later phases in prehistory as evidence by the discovery of a bronze palstave from a bog in the townland of Falsk (NMI Record). This is a possible example of the widespread ritualised practice in the later phases of prehistory in

Ireland involving the deposition of weaponry, ornaments and other objects into watery places. This practice is most famously illustrated by the Late Bronze Age hoard of objects known as the 'Dowris' Hoard which was discovered in a bog in the 1820s c. 8km southwest of the proposed site in the townland of Whigsborough. The hoard, which may originally have comprised of over 200 objects, included weaponry, axes, gouges, knives, razors, buckets, cauldrons, horns, and pendants amongst other things. It is the largest collection of bronze objects ever found in Ireland (Waddell 1998, 255).

As the raised bogs in Offaly formed during the prehistoric period the construction of pathways and tracks was necessary to negotiate routes through and into the bogs. This is most frequently demonstrated by the togher or trackway; thousands of examples have been identified through archaeological survey in the midland's raised bogs (O'Sullivan 2007, 169). Most sites were constructed of brushwood or roundwoods or a combination of both and were only of short length, probably designed simply to cross small localised wet patches in, or at the edge of, the bog (O'Sullivan 2007, 175). In the vicinity of the proposed development at least four toghers were identified in Derrybrat Bog (NMI IA 174/66; SMR OF023-040; OF023-014001-03), located to the south of Lumcloon and in Broughal townland. Although the exact location of these toghers has not been recorded, they are likely to have been situated close to the boundary between the townlands of Broughal and Lumcloon, c. 2km south of the proposed development site, between two areas of dryer ground. They consisted of the fragmentary remains of four timber toghers, running in slightly different directions and were constructed of timbers in the round laid side by side at right angles to the lines of the toghers and supported by beams laid longitudinally below them (Lucas 1985, 39; OF023-014001-003 – (Archaeological Survey of Ireland, Record Details) on www.archaeology.ie. Compiled by Caimin O'Brien. Posted 26 January 2009). Another discovery from this vicinity is that of a possible prehistoric idol which was found by the Discovery Programme at a point 1.55km south-southeast of the Lumcloon Power Plant in an area that had been milled by Bord na Móna. This is one of only a handful of such objects to have been found in the country (Grogan, unpublished).

An object frequently found in Irish bogs is bog butter. Two examples have been found in the townland of Lumcloon (NMI 1957:132; 1977:2177; see Appendix 15.1.1 one of which was discovered just 200m southeast of the proposed development site. In this case (NMI 1957:132) the butter was contained within a wooden vessel measuring 12 inches in diameter and with a depth of 8 inches. It contained approximately 42 lbs of butter. The majority of Irish bog butters probably date to between the Iron Age and the medieval periods. In a recent experiment, thirteen samples of Irish bog butter from various locations were selected, of which nine dated to the Iron Age (400 BC-500 Cal AD), three to the Medieval Period (1100-1600 Cal AD), and one much later (1520-1800 Cal AD) (Cronin et al 2007, 1011).

Of the many archaeological objects that have been discovered in Ireland's bogs, it is interesting to note that many were discovered during nineteenth and early twentieth centuries at a time when most traditional peat cutting took place on the periphery of raised and blanket bogs. More recent archaeological surveys in peatlands, such as those carried out by the IAWU, have tended to be well out on the surface of the bog in the area of modern mechanised peat extraction and in these areas thousands of wooden trackways have been discovered, but only a handful of finds. It may therefore be the case that the Bronze and Iron Age objects found were originally deposited at the edge of bogs, in watery, reedy and overgrown marginal zones between land and open raised bog and that subsequent peat growth has created a sense that these were originally bog deposits (O'Sullivan 2007, 185).

Little is known of the medieval history of this area. Lumcloon is today situated in the civil parish of Gallen. The monastery of Gallen was founded sometime in the fifth century by St. Canoc and a celebrated school was established there by emigrant monks from Wales (Gwynn & Hadcock 1970, 176). The monastery later submitted to the rule of St. Augustine. A castle was built at Gallen by the MacCoghlans. In the medieval period this area was known as Delvin Eathra, or Delvin MacCoghlan, and as the name suggests was ruled by the MacCoghlan clan in the later medieval period and does not seem to have been colonised by the Anglo-Normans (O'Brien 1998, 170). During this period Lumcloon was called Luncloon-Í-Flaithile and Ryan suggests that a branch of the MacCoghlan's descended from Flaithile were based here. The name has been anglicised to Flattery (Ryan 1994, 12). Lumcloon is mentioned on a number of occasions in the Irish annals. In 1285 A.D. a battle was fought there between Carbery O'Melaghlin, king of Meath, and Theobald Butler when Butler entered Devlin MacCoghlan with the intention of plundering it. In 1444 the annals tell of a feud between rival members of the MacCoghlans. Cormac MacCoghlan, who was bishop of Clonmacnois (1427-43), his brothers Brian and Manus, Conor MacCoghlan and some of the O'Kellys, forced an engagement against Felim MacCoghlan, and a David MacCoghlan, aided by McGeoghegan and others. The encounter took place at Lumcloon and the Bishop's army was defeated (Ryan 1994, 13). Lumcloon is again noted on the 9th May 1548 when Cormac MacCoghlan and the people of Hy-Many made an incursion into Delvin and burned and plundered Lomchluain-I-Flaithile (AFM 1548; see Cooke 1858, 382-384). The fact that the annals mention specifically that Lumcloon was plundered in 1548 does imply that there was something there to plunder and burn but what was there, or where exactly it was located, is not known. The various entries in the annals to battles taking place at Lumcloon also suggest that it was located on a routeway along which invading armies could travel into the area.

Pender's *Census of Ireland*, dating from *c*. 1659, lists a 'Lomclon' and although it is noted as being within the parish of Reynagh, it probably corresponds to Lumcloon. The population of the townland is given as 13, two of whom were English and the remainder Irish (Pender 1939, 443). The exact number of persons recorded for this 'census', actually a poll tax aggregate, is not certain, but may only reflect persons above the age of fifteen. It has been suggested that a multiplier of three could be applied to the above figure to achieve a more realistic total number of persons, but any such calculation should be treated with a degree of caution (Byrne 2004, 56).

15.1.3.2 Ferbane Power Plant

In more recent time Lumcloon is best known as the site of Ferbane Power Station. Construction began at Lumcloon in May 1953 of the first milled peat generating station in Western Europe. Earlier stations constructed were powered by sod peat but, following a change in Bord na Móna's production policy in the early 1950s which saw a change to the more economic production of milled peat, Ferbane was the first of three stations constructed for the use of the new fuel.

The first stage of development at the power plant at Lumcloon, of 60,000 kilowatts, was commissioned in 1957. The second stage of development, of 30,000 kilowatts, was commenced in June 1961 and was commissioned in January 1964. This brought the total capacity of the station to 90,000 kilowatts capable of producing 400 million units of electricity a year. The station used about 2,000 tonnes of milled peat per day, delivered by the extensive network of bog railway in wagons holding about 5 tonnes each. The milled peat was tipped onto conveyor belts which lifted the fuel up to the bunkers. There were two water cooling towers, each almost 90m in height, through which 4 million gallons of water per hour was continuously circulated and cooled (McGowan & Corkery 1978, 122-123). The station closed in 2001 and was subsequently decommissioned by 2004.

15.1.3.3 Cartographic Evidence

Lumcloon is named on William Petty's Atlas of Ireland (*Hiberniae Delineatio*) in 1685.

The earliest detailed survey of the area was undertaken by the Bogs Commissioners who were appointed in the second decade of the nineteenth century to assess the potential of

Ireland's bogs for agricultural reclamation. The maps produced by the bogs commissioners for their survey may have been based on an earlier survey of King's County (modern Co. Offaly) carried out by William Larkin who produced a working copy of his map for the Commissioners (1809) (Horner 2006, 23-27).

This map shows little detail in the area around Lumcloon but does show Millbrook Mill and the mill race leading to it from the Silver River.

The area around Lumcloon was included in District No. 5 for the purposes of the Bogs Commission survey and this was completed by 1811 by John Longfield. This map shows the study area in a little more detail, depicting what appears to be two buildings opposite the entrance to Millbrook on the modern R357 which are not shown on Larkin's map. Millbrook is here noted as a 'Mill' for the first time. The course of the Silver River is also shown in more detail.

The 1st edition Ordnance Survey 6-inch map shows the study area in more detail again and the site of the proposed development is shown as a greenfield area to the north of Millbrook Flour Mill, delimited by the road to the north, a field boundary and mill race to the east, the laneway to Millbrook to the west and with a number of field boundaries running through the area (see Figure 15.1.2).

By the time of the 1880 revision of the 6-inch map Millbrook flour mill seems to have closed down and the former mill building is now marked as a National School. The mill race no longer joins the Silver River near Lumcloon Bridge and the channel of the river itself has been straightened, probably part of drainage works in the area. The immediate area of the proposed development does not seem to have changed (see Figure 15.1.3)

The RMP map (Figure 15.1.1) is based on the 1912 edition of the OS 6-inch map and here the mill race is marked as disused but little else has changed.

15.1.4 Field Assessment

15.1.4.1 Introduction

The site visit was undertaken by Bairbre Mullee of CRDS Ltd on Monday 2nd March 2009 in overcast and occasionally drizzly conditions. Access was through gates on the R357 Cloghan to Blueball road.

The survey began at the entrance gate in the northwest corner of the site. The gate is situated c. 150m from the north-western corner of the site along the northern boundary. From this corner, to the gate, the boundary comprises a post and wire mesh fence, with scrub growing on the interior of the boundary. There is a broad high (c. 2m) grass verge between the road and the site. To the east of the gate, the remainder of the northern boundary is also delineated by a very deep drainage ditch. The ditch, c. 1.5m below the road level, is 3m wide at the top and there is a significant bank on the southern side, for most of its length, presumably including dredged materials from drainage works. There is water in the ditch and one access point across (IN13766, ITM19724), comprising a modern single-arch bridge clad with randomly coursed stone and with a pipe aperture. The bridge appears to be wide enough to accommodate vehicle. Between this bridge and the site gate, is a small area of what appears to have been ornamental planting.

Immediately to the west of the gate, there is a substantial plantation of mature conifers; this stand of trees is separated from the north and west boundaries by an avenue on each side, leaving a cleared area c. 3m in width. The plantation occupies the north-western section of the site. To the south of these are 4 pylons, carrying 220/440 kV lines, running westwards. The western boundary, consisting of fencing and hedgerow, has been trimmed/cut down to the height of the fencing, where the wires extend westwards from the pylons. The western boundary, as it extends south, beyond the proposed impact area, consists of mature trees and hedgerow. There was an entrance at the southwest corner of the site however this has been blocked up with bunded earth.

The southern boundary of the site is delineated by a post and wire double strand fence. To the south, there is a work shed still extant. This sits on a layer of concrete hard standing which has been removed elsewhere; the reduced ground level south of the site is up to c. 0.25m below this.

The eastern boundary is also delineated by the post and wire double fencing, which continues around to the north-eastern corner of the site. In addition, there is a narrow, shallow ditch along the eastern boundary; this gives way to an earthen embankment, 1.5m in height, along the northernmost section of the eastern boundary. This is heavily grassed over and contains modern rubbish; metal fragments, car wheel etc, presumably resulting from clearance. Immediately east of the northeast corner is a gateway belonging to the ESB, this led to a road skirting the eastern boundary of the site and following the route of the old mill road (see Figure 15.1.2)

The interior or the site was difficult to assess as it is now overgrown with vegetation. However a number of features, identified Ordnance Survey aerial photographs of the site dating to 2000 have been removed by subsequent site clearance associated with the decommissioning of the power station in 2003.

A light railway ran through the centre of the site and continued eastward along the northern boundary (Ordnance Survey aerial photos, 2000); this railway is traceable along its north-south extent.

There was a building complex to the east of the railway, in the southeast section of the proposed development site. This has been cleared and this has been back-filled with hardcore. In addition, the ground here is more uneven then else where on the site.

The main buildings on site were in the centre of the site. The buildings have been demolished and there are areas of hard-standing/concrete slab to the north and south which are partially grassed over and partially under standing water.

The pylons survive from the old power station and there appears to have been no impact in the grassy area in which they are situated.

The plantation of mature conifers in the northwest of the site and the area of ornamental planting appear unchanged.

The Silver River flows north-south just east of the site. The river, which has been canalised as part of drainage over the last century, is *c.* 8-10 in width, the depth at the bridge is *c.* 50cm. The river is relatively clean and the flow is slow. Lumcloon Bridge is located to the northeast of the site and carries the R357 over the Silver River. It is mid-20th century in date and was constructed as part of the River Brosna Drainage Scheme.

The banks are 2m in height over the river, and are steep grassy banks, south of the bridge. North of the bridge, they are also grassy but decrease in height, are less steep and less regular. There are two extremely large limestone boulders on the east bank of the river, north of the bridge. There are also large boulders visible in the bank further north of the bridge.

The landscape to the south of the power station is dominated by the Boora bog which provided the peat for the former power station. There is a railway bridge 20m south of Lumcloon Bridge, which delivered the peat supply to the power station.

North of the river, the fields are flat and in grass, below the level of the road with field boundaries comprising hedgerow and ditches.

15.1.4.2 Archaeological and Cultural Heritage Significance of the Site

There are no recorded archaeological monuments in the immediate area of the proposed development. However, the important Early Mesolithic habitation site at Lough Boora is located just 2km to the southeast of the proposed development. As noted above, the site was inhabited prior to the growth of the peatlands which covered and preserved the site and has been argued that sites of a similar nature remain to be identified from this area (McDermot 1998, 11). Recent archaeological surveys in peatlands have tended to concentrate on the interior of the bogs, areas exploited for modern mechanised peat extraction. The surveys have, for the most part, avoided the peripheral or marginal areas which are now often cut away or have been reclaimed. The Geological Survey map of this area (*c.* 1840) describes the area of the proposed development as 'moory flat', with gravel along the banks of the Silver River. It is precisely marginal areas like Lumcloon, located on the fringes between the deep bog and dry land, which could hold the most potential for the discovery of archaeological sites and deposits (Conor McDermott *pers comm.*; O'Sullivan 2007, 185-86). The find of a bog butter just 200m from the site is further evidence of this. In addition, there are a number of prehistoric finds of significance recorded from the surrounding area, including the Dowris hoard and the possible wooden idol from Boora Bog. The historic records of battles taking place at Lumcloon suggests it was located on a routeway in the medieval period, an impression further supported by the topography of the area. Lumcloon is located on a ribbon of dryland within an extensive wetland and is an obvious choice for a traveller seeking a route through this landscape. The location of trackways in Derrybrat bog is further proof that people were moving through this landscape in the past. Furthermore, the siting of the proposed development at the edge of a bog and close to a river would mark it out as an ideal location for *fulachta fiadh*.

15.1.5 Impact Assessment

As noted above, the proposed development is located on the site of the former Ferbane Milled Peat Power Station. A great proportion of the site has therefore been disturbed in the past. However, the depth and level of that disturbance is difficult to quantify on the basis of a walkover survey as the interior of the site is now largely overgrown with vegetation. An examination of aerial photographs of the area taken before and after the decommissioning of the plant does suggest that there are areas of the site which were never subject to construction. These are located in the north-western corner of the site which is currently under plantation, in the area of the proposed warehouse and Above Ground Gas Installation (AGI), and at the north-eastern end of the site, in the area of the proposed Steam Turbine, Control Room, Air Cooled Condenser and Fuel Oil Tank. As noted above, the site of the proposed development is considered to be an area of archaeological potential. It is possible that sub-surface archaeological remains survive in undisturbed areas of the site. Should archaeological remains survive within the site, then they could be directly and/or indirectly impacted by construction works associated with the proposed development.

15.1.6 Mitigation

In order to mitigate for the potential occurrence of sub-surface archaeological remains in the area of the proposed development, it is recommended that further archaeological assessment should be undertaken prior to construction by a suitably qualified archaeologist with experience in wetland archaeology and the specific requirements of testing in this environment.

A programme of archaeological test excavation in the greenfield area at the northeast end of the development site is proposed as this area appears to have been largely undisturbed by previous development on the site, i.e. the Ferbane Power Plant, and is therefore the area most likely to reveal archaeological remains. The assessment should investigate the possible existence of sub-surface archaeological material. Should any archaeological material be discovered, the assessment should quantify and qualify the extent, depth (to Ordnance Datum), complexity and significance if this material. The assessment should include a detailed archaeological impact statement which specifies the impact of the proposed development, its services and enabling works, on any identified archaeological material, both in terms of direct and indirect (e.g. change in water table) impacts. The assessment should also contain detailed mitigation recommendations so that a scope of archaeological works can be produced, programmed and costed. Proposed mitigation measures may include preservation in situ, preservation by record (excavation), or archaeological monitoring. If the assessment finds there to be no archaeological material on the development site, no further action would be required.

Please note that the recommendations given here are subject to the approval of the National Monuments Service of the Department of Environment, Heritage and Local Government.

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- The Irish Stone Axe Project Database. Department of Archaeology: University College Dublin.

15.2 ARCHITECTURAL HERITAGE

15.2.1 Introduction

The potential impacts of the proposed development on the architectural heritage are addressed in this section of the EIS. The architectural heritage assessment comprises a desk top study and field survey of the land on which the development is planned.

15.2.2 Methodology

15.2.2.1 Introduction

The assessment of architectural heritage utilised a number of sources including the Offaly County Development Plan, documentary, cartographic and aerial photographic sources supplemented by a field inspection of the site of the proposed development.

15.2.2.2 Historical Research

Historical research began with an assessment of bibliographic sources including the British and Irish Archaeological Bibliography (www.biab.ac.uk) and Hayes Indices of manuscripts and periodicals (Hayes 1965, 1970). It continued with a review of published books and periodicals on the area including Lewis Topographical Dictionary (1837), Offaly: History and Society (Nolan & O'Neill 1998), and Offaly heritage: journal of the Offaly Historical & Archaeological Society.

15.2.2.3 Cartographic Sources

Reference to cartographic sources is important in tracing land use development within the area as well as providing important topographical information on architectural heritage sites. Cartographic sources consulted included the Ordnance Survey 6" maps, first and later editions (T.C.D. Map Library), William Larkin's A Map of the Bogs of Allen within the Kings County in Ireland (1809), John Longfield's map of this area for the Bogs Commissioners (1810), both of which are reproduced in Arnold Horner's Mapping Offaly in the early 19th century (Horner 2006).

15.2.2.4 Offaly County Development Plan 2009-2015

The Offaly County Development Plan 2009-2015 (Offaly County Council) was consulted in order to establish whether any structures within the study area (i.e. 500m from the centre of the proposed development site) were included in the Record of Protected Structures or in an architectural conservation area. No structures within the study area are included in the Record of Protected Structures or in an architectural conservation area.

15.2.2.5 Aerial Photographic Sources

The aerial photographic collections of the Ordnance Survey of Ireland were assessed to establish if architectural heritage sites are present within the study area. The availability of aerial photographs dating to 2000 and 2005 allowed the comparison of the site prior to and following its decommissioning.

15.2.2.6 National Inventory of Architectural Heritage.

The National Inventory of Architectural Heritage (NIAH) is a systematic programme of identification, classification and evaluation of the architectural heritage of the State. The Minister for the Environment, Heritage and Local Government is currently using the Inventory as the basis for making recommendations for inclusion in the Record of Protected Structures; however, the survey of rural areas of Co. Offaly is, as yet, incomplete.

15.2.2.7 Industrial Heritage Review

The Bridges of Offaly County: an Industrial Heritage Review, commissioned by Offaly County Council, presents the results of a survey of over 400 bridges in the county. The objectives of this survey were to make a comprehensive record of all identified bridges and to highlight those bridges of special heritage significance which merit statutory protection.

15.2.3 Baseline Findings

15.2.3.1 Lumcloon

The earliest detailed survey of the area was undertaken by the Bogs Commissioners who were appointed in the second decade of the nineteenth century to assess the potential of Ireland's bogs for agricultural reclamation. The maps produced by the bogs commissioners for their survey may have been based on an earlier survey of King's County (modern Co.

Offaly) carried out by William Larkin who produced a working copy of his map for the Commissioners (1809) (Horner 2006, 23-27). This map shows little detail in the area around Lumcloon but does show Millbrook Mill and the mill race leading to it from the Silver River.

The area around Lumcloon was included in District No. 5 for the purposes of the Bogs Commission survey and this was completed by 1811 by John Longfield. This map shows the study area in a little more detail, depicting what appears to be two buildings opposite the entrance to Millbrook on the modern R357 which are not shown on Larkin's map. Millbrook is here noted as a 'Mill' for the first time. The course of the Silver River is also shown in more detail. In the early 19th century the mill was in the hands of Dennis Cassin, Esq. but by the mid-19th century the occupier is recorded as Peter Callaghan who leased a house, herd's house, corn mill offices and land from the Earl of Rosse (Griffith 1847-1864, 120).

The 1st edition Ordnance Survey 6-inch map shows the area in more detail again and the site of the proposed development is shown as a greenfield area to the north of Millbrook Flour mill, delimited by the road to the north, a field boundary and mill race to the east, the laneway to Millbrook to the west and with a number of field boundaries running through the area (see Figure 15.1.2).

By the time of the 1880 revision of the 6-inch map Millbrook flour mill appears to have closed down and the former mill building is now marked as a National School. The mill race no longer joins the Silver River near Lumcloon Bridge and the channel of the river itself has been straightened, probably part of drainage works in the area. The fields in which the proposed development is located do not appear to have changed and do not include any structures (see Figure 15.1.3).

On the Ordnance Survey 25-map of 1911, the mill race to Millbrook mill is marked as "disused" and extensive drainage ditches have been constructed along the northern, western and south-eastern boundaries of the site.

In more recent time Lumcloon is best known as the site of Ferbane Power Station. Construction of the first milled peat generating station in Western Europe began at Lumcloon in May 1953. Earlier stations constructed were powered by sod peat but, following a change in Bord na Móna's production policy in the early 1950s which saw a change to the more economic production of milled peat, Ferbane was the first of three stations constructed for the use of the new fuel.

The first stage of development at the power plant at Lumcloon, of 60,000 kilowatts, was commissioned in 1957. The second stage of development, of 30,000 kilowatts, was commenced in June 1961 and was commissioned in January 1964. This brought the total capacity of the station to 90,000 kilowatts capable of producing 400 million units of electricity a year. The station used about 2,000 tonnes of milled peat per day, delivered by the extensive network of bog railway in wagons holding about 5 tonnes each. The milled peat was tipped onto conveyor belts which lifted the fuel up to the bunkers. There were two water cooling towers, almost 90 metres in height, through which 4 million gallons of water per hour was continuously circulated and cooled (McGowan & Corkery 1978, 122-123). The station closed in 2000 and was subsequently decommissioned by 2004.

15.2.4 Field Assessment

The site visit was undertaken by Bairbre Mullee of CRDS Ltd on Monday 2nd March 2009 in overcast and occasionally drizzly conditions. Access was through gates on the R357 Cloghan to Blueball road.

The interior or the site was difficult to assess as it is overgrown with vegetation. However a number of features, identified on Ordnance Survey aerial photographs of the site dating to 2000 had been removed by subsequent site clearance associated with the decommissioning of the site (see www.osi.ie)

A narrow gauge railway line ran through the centre of the site and continued eastward along the northern boundary (Ordnance Survey aerial photos, 2000). Part of the line is traceable along its north-south extent where it is set into concrete slab. It was part of a network of lines which ran out into the Boora bog. The locomotives which ran on the line were used to deliver the milled peat to the generating plant.

There was a building complex to the east of the railway, in the southeast section of the proposed development site. This has been cleared and back-filled with hardcore. The ground here is more uneven then elsewhere on the site.

The main buildings were in the centre of the site. The buildings have been demolished and there are areas of hard-standing/concrete slab to the north and south which are partially grassed over and partially under standing water.

The pylons survive from the old power station and there appears to have been no impact in the grassy area in which they are situated.

A plantation of mature conifers covers the northwest of the site.

15.2.4.1 Silver River and Lumcloon Bridge

The Silver River flows north-south just east of the site. The river is c. 8-10 metres in width and the depth at Lumcloon bridge is c. 50cm. The course of the river has been impacted by canalisation associated with the Brosna Drainage works and by its diversion to feed the mill race of Millbrook Flour Mill.

The landscape to the south of the power station is dominated by the Boora bog which provided the peat for the former power station. There is a railway bridge 20m south of Lumcloon bridge, which carried the peat supply to the power station. The three–span bridge dates to c. 1958 and is constructed of metal girders.

The present Lumcloon bridge is mid-20th century in date and was constructed as part of the River Brosna Drainage scheme. The bridge is constructed of shuttered concrete with two flat arches. The bridge has three concrete piers, one built into the banks to either side of the river and one in the centre of the river. Plaques to either side of the bridge are inscribed in English 'Office Of Public Works Brosna Drainage Rebuilt 1949' and in Irish 'Oifig na hOibreacha Poiblí, Sceim Siltin na Brosnaighe, Altógtha 1949'.

15.2.4.2 Architectural Significance of the Site

Only two features of architectural heritage significance were noted during the baseline survey. Lumcloon bridge and the bridge which carried the bog railway over the Silver River are listed in the Bridges of Offaly County: an Industrial Heritage Review (Ref. No. OFIAR-023-060 & Ref. No. OFIAR-023-020). Both structures are rated as being of local heritage significance.

15.2.5 Impact Assessment

As noted above only two features of architectural heritage significance was noted during the baseline survey. Both features, Lumcloon Bridge and the bridge which carried the bog railway over the Silver River, are located outside the area of the proposed development and will not be directly impacted.

15.2.6 Mitigation

No mitigation measures are required.

15.2.7 References and Consultations

- Griffith, R. 1847-1864. General Valuation of Rateable Property in Ireland Gallen Parish, Kings County.

- Hogg, W. 2008. Mills of Ireland: A list dated about 1850. Dublin.

16.0 MATERIAL ASSETS

16.1 INTRODUCTION

This chapter evaluates the impacts, if any, which the development will have on material assets. In the EPA advice notes on current practice in the preparation of Environmental Impact Assessments, 2003, material assets are defined as '*resources that are valued and that are intrinsic to specific places, they may be either human or natural origin and the value may arise for either economic or cultural reasons*'. Table 16.1 outlines the recommended objectives which the EPA recommended should be assessed as part of the material assets study.

Table 16.1 Material Assets – EPA Recommended Assessment Objectives

Asset Type	Natural Origin	Human Origin
Economic Asset	- assimilative capacity (air &water) - non renewable resources	- settlements - transportation infrastructure - major utilities - ownership and access
Cultural Asset	- archaeology - architecture - settlements - monuments, features, landmarks - historic sites and structures - geological heritage	- language and dialects - folklore and tradition - religion and belief - literary and artistic association

The assessment of cultural heritage is discussed under Section 15.1 Archaeological and Cultural Heritage, and therefore this section evaluates the economic assets only.

16.2 OWNERSHIP AND ACCESS

As outlined in Section 1, the proposed development consists of the construction of a power plant at an 11 hectare brownfield site in Lumcloon, Co. Offaly. The proposed facility will include a building to house the power plant, gas turbines, heat recovery steam generators and steam turbine generators, administration / control building, raw and fire water storage, demineralisation water treatment plant, warehouse / stores building and internal roads and parking. Lumcloon Energy is applying for full planning permission for this development. There will be no severance of land as a result of the proposed development or loss of rights of ways or amenities or rezoning of land required.

16.3 WATER SUPPLY AND USAGE

16.3.1 Process Water

Water for use in the process will be pumped from the existing on site well which served the former peat burning power plant and cooling towers. Raw water will be stored on site in a tank of approximately 3,500m^3 for the process. Water will be pumped from the raw water storage tank to the water demineralisation treatment plant for use in the power generation process as high purity water is required to prevent degradation to plant components and maintain the integrity and performance of the power plant. Figure 2.10 contained in Chapter 2, illustrates the water and wastewater flows at the proposed development.

The water treatment process will consist of filtration, and either a resin based or a Reverse Osmosis and Electro De-ionisation (EDI) based treatment system. pH adjustment will be provided by acid (sulphuric) or alkali (sodium hydroxide) addition as required. Additional equipment may be applied to the system if the water quality warrants it. This equipment may include an optional decarbonator and a softener, if required.

Oxygen scavenging and thermal de-aeration will be combined to remove dissolved oxygen from the boiler water, which again prohibits corrosion. It is expected that demineralisation water consumption (losses and blow-down) will be in the range of 0.5 to 1.0% of the maximum steam flow from HRSGs to compensate for boiler blow down for a condensing plant without process extractions. A 0.5% flow would equate to a need for approximately 1m^3 of water per hour per HRSG, which equates to approximately 96m^3 per day (approximately one litre per second). Deviations may appear during unusual conditions and as a result requirement may at times be in the range of 3% of the HRSG steaming rate. The figure will also be influenced by raw water quality and the selected method of water treatment.

The capacity of the demineralised water storage tank will be sized following consideration of the volume required for filling up of the steam/water system. At this stage it is estimated that the volume required to fill system from empty will be approximately 420m^3. Therefore it is proposed to install two 300m^3 water tanks to supply the HRSG system.

16.3.1.1 Process Wastewater Treatment

Process wastewater will consist of wastewater from the demineralisation plant and wastewater generated from boiler blow-down. Wastewater from the demineralisation plant will comprise water containing the salts removed from the raw water or neutralised backwash of the resins from the demineralisation process. Boiler blow-down is water which has been circulating in the water/steam cycle of the process. Process wastewater will be continuously generated from the plant while in combined cycle operation mode. There will be little wastewater generated while in open cycle mode. Typical normal wastewater volumes generated will be approximately 96m^3 per day.

Steam generated in the HRSGs will be used to drive the steam turbine generators. The steam will then be condensed back to water via the air cooled condensers for reuse in the process. Therefore, no cooling waters will be discharged. Process effluents from the plant will be routed via the on-site process wastewater treatment plant to effluent drainage system. The process wastewater treatment plant will comprise a below-ground concrete structure containing a number of chambers, which will allow agitating and pH and temperature correction. Continuous monitoring will be undertaken in the final chamber for dissolved oxygen, pH, conductivity and temperature. Treated process wastewater will then be discharged via the wastewater collection system to the Silver River via the discharge point located in the north eastern corner of the site.

An automatic sampler will also be positioned at the discharge point which will sample water discharges on a continuous basis over a given period as prescribed by the Integrated Pollution Prevention and Control (IPPC) licence. An on site laboratory will also be provided to facilitate monitoring of specific parameters on site.

A more detailed description of the plant's process effluent streams is provided in Chapter 2, Project Description.

16.3.2 Potable Water

Potable water will be obtained from the Leabeg – Leamore Group Water Scheme. It is estimated that a maximum of 3.5m^3 per day of potable water will be required for use at the facility, i.e. canteen, washing facilities, etc. It is proposed to source *'grey'* water i.e. that required for flushing toilets and other service use, from the on site well via the raw water storage tank.

16.3.3 Fire Water/ Water Storage Tank

Raw water will be stored on site in a tank of approximately 3,500m^3 for the process. This raw water storage tank will also serve as a reservoir for fire fighting purposes. In case of fire the applied fire fighting water will be drained into those parts of the plants effluent system which drain the affected areas and the resulting streams will finally be delivered to the facility's storm water drain or effluent drain.

16.3.4 Foul Wastewater

Foul wastewater, comprising wastewater other than process waste water and surface water, will be treated in a proprietary treatment system prior to discharge. Treated wastewater (from canteen and toilets) will be discharged to the Silver River via the stream which runs along the northern boundary. However the option of percolating to ground will also be considered at detailed design stage following completion of a site suitability assessment. This will require percolation testing to determine the suitability of the site for this purpose.

16.3.5 Surface Water

Surface water collected from roofed and paved areas will be delivered to the storm water drainage system. In order to ensure that uncontaminated surface water drains are not mixing with possibly oil contaminated surface water drains, 'oil risk areas' will discharge into a separate collection system. Surface water will be routed via an oil/water interceptor and be discharged through an attenuation tank (controlled discharge) to Silver River via the stream in the north eastern corner of the site. Large external areas/compounds at the site will be surfaced with stone to allow rainwater to percolate to the underlying soils.

During times when chemicals are handled, isolation valves will be closed. This is to ensure that accidently spilled chemicals do not enter the storm water drain. The isolation valves will only be opened again once it has been determined that contamination of the downstream system can be excluded.

General plant drainage consists of effluents produced by sample drains, equipment drains, equipment leakage, area wash-downs, etc. This effluent will be collected in a system of floor drains and sumps and routed to the condensate pit which represents the lowest drainage point in the plant. From there it will be delivered to the wastewater treatment plant via a water/oil separator

16.4 AIR

An assessment of the existing air quality and proposed impacts and mitigation measures are described in Section 11 Air Quality.

16.5 NON RENEWABLE RESOURCES

Non renewable resources are defined as resources that are not continuously replenished by nature, the most well know being fossil fuels including coal, oil etc. Details of the proposed raw materials including non renewable resources are described in Section 2, Project Description.

In so far as possible, non renewable construction materials will be sourced locally and all imported material that will be used on site will be from approved sources. Further details regarding the construction of the development are outlined in Chapter 3, Construction.

16.6 SETTLEMENTS (INCLUDING LANDUSE AND TOURISM)

The existing site is located approximately 5km south east of Ferbane. Other nearby settlements include:

- Athlone – located approximately 22km from the site
- Birr – located approximately 15km south of the site
- Tullamore – located approximately 20km from the site
- Ballinasloe – located approximately 33 km west of the site

The settlements in close proximity to the townland of Lumcloon, has been evaluated in detail in Section 4, Human Beings.

16.6.1 Landuse

Lumcloon Energy acquired the brownfield site in 2008 which was the site of the old Ferbane Power Plant. The plant was closed in 2000 and was decommissioned with the station building demolished in 2003. The site meets all the technical and financial requirements for the development of a modern Gas Turbine based thermal power plant. Prior to selling the site the ESB received planning permission in 2004 from Offaly County Council for a 100 MW Simple Gas Turbine power plant at the proposed site. The site has access to grid connection for a power plant in excess of 300MWs by confluence of four 110kv three phase transmission lines at the site. The site is well serviced with accessible roadways, water sources, waste disposal facilities and other necessary amenities as existed during the construction and operation of the previous peat fired power plant located at the site.

The proposed facility will be located on an area of approximately 11 acres, as the proposed development will be constructed on Lumcloon Energy's lands only and not on any other agricultural lands

16.6.2 Tourism

Tourism is discussed under Section 4, Human Beings.

16.7 TRANSPORTATION INFRASTRUCTURE

Details regarding the road network are discussed under Section 14, Traffic.

16.8 WASTE MANAGEMENT

16.8.1 Waste Management: Construction Phase

Disposal of waste during the construction phase is described in Section 3, Construction.

16.8.2 Waste Management: Operational Phase

16.8.2.1 Process Waste

The treatment of process waste water is detailed in Section 16.2.1. This section describes the waste management process whereby all wastes produced by the proposed development will be properly collected, treated as necessary and disposed of.

16.8.2.2 Non-Hazardous Solid Waste

The operation and maintenance of the plant will generate non-hazardous solid waste typical for power generation facilities. This waste will include scrap metal and plastic, insulation material, paper, glass, empty containers and other miscellaneous solid wastes. These materials will be disposed of by means of contracted refuse collection and recycling services.

16.8.2.3 Hazardous Solid and Liquid Waste

The methods used to properly collect and dispose of any given hazardous solid or liquid waste generated by the plant will depend on the nature of the waste. Hazardous solid and liquid waste that will be generated by the plant includes;

- Spent lubrication oil filters
- Waste lubrication oil
- Fuel oil from failed start attempts acid and alkaline cleaning solutions used for pre-operational chemical cleaning of the HRSG pressure parts and steam cycle piping systems
- Acid cleaning solutions used for periodic chemical cleaning of the HRSG
- Boiler cleaning solution for periodic cleaning of the HRSG fire side

These wastes will be stored temporarily on-site and later disposed of by specialised licensed contractors.

16.9 SITE UTILITIES

16.9.1 Electricity / Gas Supply

The power plant will supply electricity via the regulated electricity market. Natural gas, supplied from the Bord Gais Network grid, will be the primary fuel source for the facility. Natural gas will be supplied at a pressure of 70 bar-g via a 450mm buried pipeline entering the site at its north west corner. At the above ground installation the pressure will be let down to 35 bar-g. It will then flow via a buried pipeline to the gas receiving area at the north west of the turbine buildings. From here the gas will pass into the turbine buildings and will flow into the gas turbine units. As discussed previously, the construction of gas pipeline from the gas network to the site is not part of this planning application.

To comply with the Commission for Energy Regulation, diesel will be used as backup fuel in the event of interruption to the natural gas supply. Five days running capacity of diesel will be stored on site, (approximately 5,000m^3) within a 110% capacity bund. The diesel oil will be limited to 0.1% sulphur in fuel as per the requirements of EU Directive 1999/32/EC (relating to a reduction in the sulphur content of certain liquid fuels). Connection to the National Grid will be the subject of a separate application, which will be conducted by the applicant in association with the Electricity Supply Board (ESB). The plant will consume approximately 15MW of power (house load) as part of its operation.

16.10 IMPACTS AND MITIGATION MEASURES

16.10.1 Ownership and Access

All lands within this application are currently brownfield. The proposed facility will not result in any significant environmental impacts relating to land severance or land access as the applicant owns all the lands relating to this application. The brownfield site which was once the site of the Ferbane power plant will be returned to a similar landuse. The impacts that the proposed development will have on the environment have been assessed in full in Chapters 3 to 15 and mitigation measures required to reduce significant impacts have been outlined.

16.10.2 Water Supply and Usage

Water for the site including process water and fire water will be supplied from an on site well. Section 8, Groundwater, has assessed the impacts that such a water demand will have on the sites aquifer and outlined the necessary mitigation measures to avoid any significant impacts on the environment.

The requirements to ensure prevention and control of fire will be addressed under a separate application to the Fire Authority. All mitigation measures required to ensure safety on site will be regulated by the Fire Authority.

The foul water generated on site will be treated to a standard as required by the EPA and Local Planning Authority. The foul wastewater treatment plant will be installed and maintained in accordance with the manufacturer's specification. During installation mitigation measures as outlined in Chapter 9, Hydrology, will be adhered to in order to prevent surface water contamination. Impacts and mitigation measures associated with surface water are detailed in full in Chapter 9.

16.10.3 Non Renewable Resources

The type and quantity of non renewable raw materials proposed to be used at the facility and during construction are outlined in Chapter 2, Project Description and Chapter 3, Construction. Where possible non renewable resources will be will be sourced from locally approved sources. Further impacts and mitigation measures are detailed in Chapter 2 and Chapter 3 respectively.

16.10.4 Settlements (including agriculture and tourism)

Impacts and mitigation measures associated with human beings and tourism are detailed in Chapter 4, (Human Beings) as outlined previously. No significant impacts on agriculture will result with respect to land take and land severance as the land holding is entirely owned by Lumcloon Energy.

16.10.5 Transportation Infrastructure

Impacts and mitigation measures associated with transportation are detailed in Chapter 14, (Roads and Traffic).

16.10.6 Site Utilities

As outlined in Chapter 16.9, connection to the National Grid will be the subject of a separate planning application. This will be conducted by the Electricity Supply Board (ESB). The ESB is the regulating body for electricity supply in Ireland. Therefore the ESB will ensure that any requirements necessary for this proposed development will be met by the applicant and that no impact on the existing electricity supply will result.

Natural gas will be delivered to the plant via a new below ground high pressure pipeline from the existing Bord Gais Network. This development of the pipeline form the gas network near Athlone to the site in Lumcloon is not covered under this planning application.

16.11 RESIDUAL IMPACTS

With the above mitigation measures in place, neither the construction nor operational phases of the proposed redevelopment will result in any significant negative impacts on the existing economic assets.

17.0 INTERACTIONS

In accordance with the requirements of EC Directive 85/337/EC (as amended) and Environmental Protection Agency (EPA) "Guidelines on the Information to be contained in Environmental Impact Statements" and "Advice Notes on Current Practice in the Preparation of Environmental Impact Statements", published in 2002 and 2003 respectively, the interactions between various environmental factors must be completed as part of the environmental impact assessment.

The impacts and likely significant effects on the interaction between any of the following environmental media are discussed below:

- human beings
- flora and fauna
- soils and groundwater
- surface water
- air
- noise
- climate
- material assets and
- the landscape

Table 17.1 presents a matrix of interactions likely to occur from the proposed development (highlighted in green). The level of interaction between the various media will vary greatly but the table allows the interactions to be identified and detailed where necessary. If the development does not have the potential to impact or affect the interaction then that interaction is not highlighted in green.

The interaction matrix is based on the potential interrelationships of the environmental media both during the construction and operation phases of the proposed development. Details of individual interactions are presented in Section 17.1.

Table 17.1 Interactions between Environmental Media

	Human Beings	Air	Noise	Landscape	Flora & Fauna	Hydrology	Ground-water	Soils & Geology	Climate	Material Assets	Roads & Traffic	Cultural Heritage
Human Beings												
Air												
Noise												
Landscape												
Flora & Fauna												
Hydrology												
Ground-water												
Soils & Geology												
Climate												
Material Assets												
Roads & Traffic												
Cultural Heritage												

17.1 HUMAN BEINGS

Upon evaluation of all environmental topics, landscape, air, flora and fauna, roads and traffic and noise have been identified as topics which interact with human beings. In particular these interactions would occur during construction activities as a direct result of earth works associated with installation of foundations and tank structures resulting in the generation of noise and dust. However, as outlined in Section 6 (Landscape), Section 11 (Air), Section 10 (Flora & Fauna), Section 13 (Noise) and Section 14 (Roads and Traffic) the development would have the potential of a negative impact if construction activities were to proceed without implementing adequate mitigation measures. The landscape, air, flora and fauna, roads and traffic and noise sections recognise the importance of protecting these resources from potential damage during the construction phase and have made recommendations regarding mitigation measures to prevent negative impacts. Health and Safety on site is also recognised as being of paramount importance to human beings during the construction and operation phases and this will not be compromised, if the specified mitigation measures outlined in the various chapters of the EIS are adhered too.

17.2 AIR QUALITY

17.2.1 Air Quality and Human Beings

There is potential for impact to human beings living in the area of the proposed development during the construction and operation phases of the development. These have been outlined and assessed in Chapter 11 of the EIS. The air quality impact at the nearest residential receivers is predicted to be below the relevant air quality standard limit values and is therefore determined to be low.

17.2.2 Air Quality and Flora and Fauna

The main interactions between air quality and flora and fauna are related to emissions of acidifying gases such as nitrogen oxides (NOx) and sulphur dioxide (SO_2) from the development. These emissions will not have any significant adverse impact on the receiving environment as maximum ground level ambient annual mean NOx concentrations directly due to process emissions are approximately 11% of the annual mean limit value for the protection of vegetation. At the nearest sensitive ecological receptors, i.e. Lough Boora pNHA located approximately 3km to the south east of the site and the Grand Canal pNHA located approximately 3km to the north of the site, the ambient annual mean NOx concentrations directly due to process emissions are <1% of the annual mean limit value. At the Moyclare

Bog and Ferbane Bog Special Areas of Conservation (SAC) located approximately 7km to the north east of the proposed development site the ambient annual mean NOx concentrations directly due to process emissions will be insignificant. Sulphur dioxide emissions from the combustion of natural gas are insignificant.

17.2.3 Air Quality and Climate

At present, with emissions of 16.933 tonnes per capita, Ireland has the second highest CO_2 emissions per capita of the 27 countries in the European Union (Carbon Action Ireland). The first phase of the Kyoto Protocol is from January 2008 until December 2012 and during this five year period Ireland has legally committed to limit it's emissions to a combined total of 315 million tonnes of CO_2 or 63 million tonnes per year. However, in 2007 Ireland emitted 69.28 million tones of CO_2. Carbon dioxide emission for the country as a whole can be significantly reduced by converting our conventional fossil fuel power plants to state of the art gas fired power plants and supplementing this with renewable energy supplies such as local wind farms. The proposed gas fired power station will result in significant CO_2 emission reductions when compared to alternative conventional fossil fuel generation plants such as coal fired or oil fired plants.

17.3 NOISE

17.3.1 Noise and Human Beings

The main interactions with noise are in relation to human beings and flora and fauna. The impact of noise on the human beings living in the area of the proposed development has been addressed during the construction and operational phase of the proposed development. This has been outlined in Chapter 13 of the EIS. The noise impact at the three nearest residential receivers is predicted to be below the EPA noise limits of 55dB $L_{Ar,T}$ during daytime (8am to 10pm) and 45 dB $L_{Aeq,T}$ during night time (10pm to 8am).

17.3.2 Noise and Flora and Fauna

In relation to the interaction of noise from the proposed development with flora and fauna, the noise generated by the development will not have a significant adverse impact on the local birdlife and wildlife. Local birdlife and wildlife will quickly accustom to any change in the noise climate of the area as occurs throughout the country. Noise levels generated during the operation of the proposed development will not be audible at the nearest sensitive ecological receptors, i.e. Lough Boora (pNHA) located approximately 3km to the south east of the site, the Grand Canal (pNHA) located approximately 3km to the north of the site, the Moyclare Bog and Ferbane Bog (Special Areas of Conservation (SAC)) which are located approximately 7km to the north east of the proposed development site.

17.4 LANDSCAPE

The landscape and visual impacts have potential interactions with impacts resulting from other environmental statement topics. The interactions of these impacts are usually highly complex in practice and this section serves to act as a brief overview to these issues. In addition, the proposed development will create varying impacts during the construction phase and the operation phase.

17.4.1 Landscape and Traffic

During the operation phase, the traffic volumes will increase and construction vehicles will be more visible along the portion of the R357 near the site. This will result in a temporary slight adverse impact on local residents and road users. During the operation phase, the traffic volumes will be slightly higher than that which pertains at present, but will result in a barely perceptible change to the perceived character of this portion of the R357.

17.4.2 Landscape and Hydrology

The Silver River is the main hydrological feature of the immediate site context, but this river is not visually significant landscape feature. There are no known negative interactive impacts between hydrology and landscape, once the specified hydrological mitigation measures are implemented.

17.4.3 Landscape and Soils & Geology

The proposed development does not require significant excavation and the proposed earthworks will not significantly alter the existing landform of the site. Therefore, there is no negative interaction between the soil and geological aspects of site and landscape and visual concerns.

17.4.4 Flora and Fauna

The removal of some of the existing vegetation from parts of the western and northern site boundaries, will reduce the level of screening into the site and also temporarily impact on the volume of vegetation providing potential wildlife habitat. However, the proposed mitigation planting will increase the variety of native tree and shrub species on site and this will have a positive impact of providing increasing screening and increased ecological benefit. The management of the site vegetation will also result in a positive impact to the appearance and condition of site vegetation.

17.4.5 Landscape and Human Beings

In relation to the potential interaction between landscape and visual impacts and impacts to human beings, the general public will be predominately concerned by the visual impact of the development and any resulting alteration to the landscape character of Lumcloon area, the Lough Boora Parklands complex and the wider Bog of Allen landscape.

The visual assessment concentrates on the potential impact of the development to the human *'visual receptors'*, predominantly the local residents and road users. The potential tourist and recreational users of the site context are also considered in the assessment, through the analysis of key visual reference points (such as the nearby Boora Parklands Complex, the R357 - Designated Scenic Amenity Route and the Offaly Way – a waymarked way).

The landscape character of the application site will experience a substantial effect during the initial construction period. During this phase, the construction machinery and vehicles will be partially visible from the immediate site context. During the operation phase of the development, the impact of the development will reduce to a slight adverse effect on landscape character, into the medium and longer term. The development will be largely obscured from viewpoints along the Offaly way and within Lough Boora Parklands and following it will not impact negatively on the tourist's overall impression of the Bog of Allen landscape.

The current site conditions may be perceived as derelict and *'damaged landscape'* by the general public. The development will alter the character of the site from rural brownfield to industrial, however the site had an industrial character in the recent past due to the former ESB plant. The proposed landscape mitigation measures will act to screen and assist integration of the development into the site and improve the appearance of the site.

17.5 FLORA AND FAUNA

17.5.1 Flora and Fauna and Hydrology

Hydrology is directly interrelated to the health and status of all aquatic based ecological systems. The main freshwater habitats onsite are the drainage channel and Silver River. All discharges and potential spillages, which have the potential to negatively impact on the hydrology of the site, also therefore have the potential to negatively impact on the flora and fauna, which depends on the hydrological system for survival. With these potential impacts in mind, the proposed development has incorporated best practice into the development including a SUDS system, process, foul and surface effluent treatment to ensure that water quality of the river system is sustained and the status of aquatic flora and fauna is maintained.

17.5.2 Flora and Fauna and Hydrogeology

In a similar manner hydrogeology is responsible for creating and maintaining the biotic conditions on which ecological systems depend. The abstraction of groundwater as part of the during the operation of the facility has the potential to negatively impact upon the Silver River's ecology and hydrology. A hydrogeological study (see Chapter 8) demonstrated that the proposed abstraction would have no direct negative impacts on the water levels within the Silver River and consequently this activity will not negatively impact on flora and fauna which depend upon the stability of water levels within the river system.

17.6 HYDROLOGY

17.6.1 Hydrology and Flora and Fauna

Hydrology plays a critical role in the status of aquatic ecosystems. Good water quality is essential for a robust, vibrant and diverse aquatic ecological community. For the proposed development, the likely significant impact between hydrology and ecology is associated with the proposed effluent and stormwater discharges and accidental spillages. The proposed development will employ recommended mitigation measures during the construction and operation phases of the development to ensure that water quality is sustained. These measures are outlined in Chapter 9, Hydrology.

17.6.2 Hydrology and Groundwater

Hydrogeology and hydrology have an intricate and complex relationship based on the interaction between groundwater and surface water and the factors which influences both media on an individual and combined basis. The proposed groundwater abstraction was raised as a concern during the consultation process. The baseline assessments determined that the proposed abstraction would have no direct negative impacts on the flow regime of the Silver River.

17.7 GROUNDWATER

17.7.1 Groundwater and Human Beings

There is an interaction between human beings and groundwater where the potential for pollution of groundwater supplies could impact on human health. No significant soil or groundwater contamination was identified at the site and residual contamination associated with historical activities was determined to be low level and localised. The impact on groundwater quality in the area due to any disturbance of contaminated soils was assessed to be negligible adverse and localised in nature. Any domestic wells identified are located upgradient of the proposed development and any potential groundwater contamination during construction will therefore not migrate towards these wells. It is not anticipated that there will be any impact on human health related to groundwater quality in the area.

17.7.2 Groundwater and Soils & Geology

There is a strong interaction between groundwater and soils and geology. Residual contamination associated with historical activities was determined to be low level and localised. The disturbance of contaminated soil during construction has the potential to impact on groundwater quality. However where necessary, excavated soils determined to be contaminated will be removal and disposed at a licensed facility

17.7.3 Groundwater and Hydrology

There is an interaction between groundwater and surface water. The surface waters within the site are the Silver River to the east and drain bordering to site to the north. It is anticipated that there will be no contamination of surface water surrounding the site from either surface runoff from the site or leaching of contaminants to groundwater which ultimately discharges to the surface water features in the area. Chemical contamination of the groundwater was assessed to be sufficiently low level so as not to pose a threat to surface water features. It has been shown that the proposed abstraction of groundwater for process use will result in a negligible impact on the Silver River.

17.7.4 Groundwater and Flora & Fauna

There is an interaction between groundwater and flora and fauna in the form of groundwater dependent ecosystems (GWDEs). There are several Natural Heritage Areas (NHAs) and Special Areas of Conservation (SACs) in the region of the proposed development which are groundwater dependent ecosystems. These are discussed in Chapter 10, Flora and Fauna, and comprise Lough Boora (NHA) (c. 2.5km to the southeast), Lough Coura (NHA) (c. 7km to the south west), Ferbane Bog (NHA & SAC) (c. 6km to the northwest) and Moyclare Bog (NHA & SAC) (c. 7km to the northwest). It is not anticipated that there will be any impact on the groundwater quality or quantity that would affect these sites. The distance of the sites from the proposed groundwater abstraction is such that there will be no impact on groundwater levels in the area of the sites.

17.7.5 Groundwater and Material Assets

There is an interaction between groundwater and material assets in the form of groundwater supplies. There is a number of private groundwater supplies within a 1km radius of the proposed development site which are used for domestic and agricultural purposes. There are also several public groundwater supplies at distances of between 7km to 15km of the site. It is not anticipated that there will be any impact on the groundwater quality or quantity that would affect these supplies.

17.8 SOILS AND GEOLOGY

17.8.1 Soils and Geology and Groundwater

There is a strong interaction between soils and geology and groundwater. The disturbance of contaminated soil during construction has the potential to impact on groundwater quality. It is not anticipated that there will be any impact on groundwater from areas on the site identified as having low-level metal, phenol and hydrocarbon contamination. The contamination assessment undertaken as part of the exit audit on behalf of ESB determined that any residual contamination present does not to pose a threat to groundwater quality and the site was considered suitable for redevelopment. The underlying clay subsoils will also prevent migration of any contaminants to groundwater.

A pump test was completed as part of the assessment on the groundwater well present on the proposed site. A groundwater water sample was collected from the well at the end of the pumping test and analysed for a range of water quality indicators. These results did not indicate any significant contamination of groundwater at the site as a result of historical operations.

17.8.2 Soils and Geology and Hydrology

There is an interaction between soils and geology and hydrology (surface water). It is anticipated that there will be no contamination of surface water surrounding the site (Silver River to the east and drain bordering to site to the north) from either surface runoff from the site or leaching of contaminants to groundwater in hydraulic continuity with surface water. The contamination assessment undertaken as part of the exit audit on behalf of ESB determined that any residual contamination present does not to pose a threat to surface water and the site was considered suitable for redevelopment. Clay subsoils underlying the site will also retard any migration of contaminants off site.

Construction activities which disturb or expose the soil have the potential to elevate suspended solids in runoff from the site which could impact on surface water bodies such as the Silver River. Mitigation measures during the construction process will prevent sediment run-off to the Silver River.

17.8.3 Soils and Geology and Human Beings

There is an interaction between human beings and soils and geology. The contamination assessment undertaken as part of the exit audit on behalf of ESB determined that any residual contamination present does not to pose a threat to human health and the site was considered suitable for redevelopment. The site was confirmed to be asbestos safe. The low level metal, phenol and hydrocarbon contamination was determined not to pose a risk to human health.

17.8.4 Soils and Geology and Material Assets

There is an interaction between land use and soils and geology. The contamination assessment undertaken as part of the exit audit on behalf of ESB determined that any residual contamination present does not to pose a risk for redevelopment of the site for industrial use.

17.9 MATERIAL ASSETS

The main interactions that material assets will have with other environmental topics include groundwater, air, roads and traffic and soils and geology. These interactions may result due to the proposed development's requirements for an on site water supply, generating dust emissions during construction, generating air emissions during operation, increasing traffic to and from the facility during construction and operation and as a result of installation of site utilities. The development would have the potential of a negative impact as outlined in Sections 7 (Soils and Geology) Sections 8 (Groundwater), Section 9 (Hydrology), 11 (Air), 14 (Roads and Traffic) however appropriate mitigation measures have been proposed which will ensure that potential impacts are avoided or reduced to low levels.

17.10 ROADS AND TRAFFIC

17.10.1 Roads and Traffic and Human Beings

The Construction phase of the development will have the largest impact on traffic flows; however it will be of a short term nature. It is anticipated that construction will be undertaken over a 32 month period beginning in 2010. Approximately 400 construction jobs will be created by the development and it is anticipated that this will generate approximately 400 car trips to and from the site per day, assuming a vehicle occupancy of two. It is anticipated that 30 HGV trips will be generated during peak construction works (civil and structural phase) as a result of delivery of materials to and from the site. The operational phase impacts are much smaller as during operation approximately 45 people will be employed. Both scenarios result in total traffic volumes much less than the capacity of the existing R357. Analysis was carried out on the proposed development junction with the development in place and it was found to have adequate reserve capacity when tested for the critical cases of the morning and evening peaks during construction, in the opening year and in the Design Year. This existing R357/R437 staggered junction when tested without the development was found to be operating efficiently. The junction has spare capacity for the natural growth of traffic as well as the development generated traffic for all scenarios. The existing local road T-Junction with the R357 is shown to have more than adequate spare capacity in the design year with all developments in place. Recommended mitigation measures to prevent any potential adverse negative impacts are outlined in Chapter, 14, Roads and Traffic. Therefore it was determined that the impacts to human beings as a result of traffic are not significant when compared with current levels.

17.10.2 Roads and Traffic and Air

As described in Chapter 11, Air, there will be negligible impacts to local air quality as a result of traffic generated during the construction and operation phases of the proposed development.

17.10.3 Roads and Traffic and Noise

The existing noise environment in the vicinity of the proposed site was observed to be typical to that of a rural area. The predominant noise sources noted were road traffic along the R357 and R437. During construction, there will be approximately 30 HGV movements per day. Construction site employee traffic volumes will result in approximately 400 vehicle movements per day assuming a vehicle occupancy of two. Existing AM and PM peak hour flows on the R357 are in the order of approximately 200 to 220 vehicle movements per day. Therefore, as a doubling of road traffic volume results in an approximate 3dB increase in noise level at adjacent properties, the noise impact from traffic during the construction phase will be negligible. Site traffic during the operation phases due to employees entering and leaving the site will give rise to a less than 20% increase in traffic flows and therefore operational site traffic will also result in an insignificant traffic noise impact in the vicinity of the proposed development site.