Bord Na Móna Energy Ltd.
Derrygreenagh
Co. Offaly

Proposed Power Plant at Derrygreenagh, Co. Offaly

Volume 1

Non - Technical Summary

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Non – Technical Summary

Preamble

Bord Na Móna Energy Ltd (BNME) commissioned Mott MacDonald Pettit Limited (MMP) to prepare an Environmental Impact Statement (EIS) and planning application for the proposed construction of a power plant development at Derrygreenagh, County Offaly The EIS is structured as follows:

- **A Non-Technical Summary**

The non - technical summary provides a synopsis of each section of the EIS highlighting the principal impacts therein.

- **Introduction**

The introduction outlines the terms of reference for the Environmental Impact Statement.

- **Background to the Project**

This chapter outlines the background to the project, the need for the facility and alternatives considered in terms of sites and technologies.

- **Description of the development**

A detailed description of the proposed development, the technology of the plant, principal plant components, processes and materials consumed, and construction and operation of the proposed development.

- **Receiving Environment, Impacts and Mitigation measures**

A detailed description of the existing environment, likely impacts due to construction and operation of the proposed development and proposed measures to reduce impacts arising during construction and operation. The following topics are addressed;

- Human Beings and Material Assets;
- Flora and Fauna;
- Water Quality;
- Soils, Geology and Hydrogeology;
- Air Quality and Climate;
- Noise and Vibration;
- Landscape and Visual Assessment;
- Roads and Traffic;
- Cultural Heritage; and
- Interactions of the Foregoing.

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Preamble

1 Introduction

1.1 Background

Bord Na Móna Energy Ltd (BNME) commissioned Mott MacDonald Pettit Limited (MMP) to prepare an Environmental Impact Statement (EIS) and planning application for the proposed construction of a power plant development at Derrygreenagh, County Offaly, (OS Grid Reference: E 249 580 N 238 208). Figure 1.1 *Site Location* illustrates the location of Derrygreenagh.

The proposed development will comprise of two generating units located on the site. These are a flexible combined cycle gas turbine unit (CCGT) of *c.* 430 megawatts (MW) and a reserve/peaking open cycle gas turbine unit (OCGT) of *c.* 170 MW. The primary fuel source for the CCGT unit will be natural gas with distillate stored onsite as a back up fuel. The OCGT unit will be capable of running on either natural gas or distillate. The proposed development will also consist of all necessary ancillary structures and equipment to allow for the efficient and safe running of the power plant. Further to this, it is proposed that the Bord na Móna Power Generation business unit headquarters will be located at the site.

The proposed development occupies a total area of 25.4 ha. The site occupies an area of 22.8 ha with the main site occupying an area of 17.5 ha and the adjacent switchyard site on the western side of the R400 roadway, occupying 5.3 ha. The proposed discharge pipeline to the Yellow occupies an area of 2.6 ha. The development site is currently used as a Bord na Móna works site where peat harvesting and transport equipment is serviced and repaired. There is also an office building on the site, which functions as the current headquarters for Bord na Móna Energy.

In a CCGT unit, a gas turbine generator generates 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. This final step enhances the efficiency of the process. 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 of any conventional generation type. The flexible CCGT unit 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.

The proposed OCGT “Peaking” unit consists of a single gas turbine linked to a generator which produces electricity. An OCGT unit is a less efficient unit than the CCGT unit with typical efficiencies in the range 33% - 36 %. However the advantage of the OCGT unit is that it can supply electricity in a much shorter timeframe than the larger CCGT unit. The OCGT unit is capable of reaching full output from cold within 20 minutes. This type of plant is also capable of turning on and off multiple times during the day in response to short term peaks and troughs in energy demand and other system requirements. A typical peaking unit does not generally make a large energy contribution to the system. Rather it provides capacity at those times when generation supply is limited or constrained. This mode of operation is characterised by extended periods of inactivity where the unit is providing contingency reserve, and a few hundred hours per year of actual running

The proposed development site is in a strategic location in close proximity to the Maynooth - Shannonbridge 220 kV power line, the Oldstreet-Woodland 400 kV power line and also to the 110 kV substation at Derryiron, adjacent to Rhode Peaking Power station, which allow for a connection to the national power grid. Electrical power will be exported from a switchyard within the proposed development site to either one or a combination of these power lines.

Natural gas, supplied from the Bord Gáis Networks (BGN) pipeline, will be the primary fuel source for the facility. To comply with the Commission for Energy Regulation's (CER) Secondary Fuelling Obligation, distillate will be used as a backup fuel in the event of interruption to the natural gas supply. Five days running capacity of distillate will be stored on site for the CCGT unit and a further three days running capacity for the OCGT unit. This equates to approximately 8,100 m^3 and 3,600 m^3 respectively. The total storage capacity on the site will amount to 15,000 m^3 which will be contained within a 110% capacity bund. The distillate will be limited to 0.1% sulphur content as per the requirements of *EU Directive 1999/32/EC, relating to a reduction in the sulphur content of certain liquid fuels.*

1.2 Environmental Impact Statement

An Environmental Impact Statement, (EIS) has been prepared in order to identify baseline environmental and socio-economic conditions in the area of the proposed development. It also predicts potential beneficial or detrimental effects associated with the proposed development, and outlines a range of mitigation measures where considered necessary. This EIS has been prepared in accordance with all relevant legislation, guidance and advice notes and will be submitted with the planning application in accordance with relevant legislative requirements.

Following consultation with An Bord Pleanála it has been determined that the proposed development is considered to be "Strategic Infrastructure". Planning applications for "Strategic Infrastructure" are made directly to An Bord Pleanála, with copies of the application sent to the relevant local planning authority(s). As the development site is close to the border of County Westmeath, a copy of the application will be sent to both Offaly and Westmeath Planning Authorities. The development is in the area of the Offaly Planning Authority.

This document is a non-technical summary providing a brief overview of the development and associated impacts and mitigation. It is recommended that the main EIS document is reviewed in order to obtain detailed information regarding this development.

The full EIS document can be viewed and purchased at the offices of An Bord Pleánala at 64 Marlborough Street, Dublin 1. It can also be downloaded from the website: www.derrygreenaghpower.ie

1.3 Methodology

The principal objective of this EIS is to identify the baseline environmental conditions in the area of the proposed development, to predict the potential beneficial and/or adverse environmental effects arising from the proposed development and to propose appropriate actions where necessary to prevent significant adverse effects where predicted.

In preparing this EIS, the following documents were taken into consideration:

- *Guidelines on the Information to be Contained in Environmental Impact Statements*, March 2002, derived from the *European Communities (Environmental Impact Assessment) Regulations 1989 to 2006*, which give effect to the European Directives 85/337/EEC and 97/11/EC;
- *Advice Notes on Current Practice (in the preparation of Environmental Impact Statements),* November 2003;
- The requirements of EC Directives and Irish Regulations regarding Environmental Impact Assessments; and
- Current Local, County, Regional and National Development Plans.

Information on the project and the receiving environment was obtained through a number of means including:

- Site visits;
- Field surveys;
- Review of existing data for the environs of the proposed development site;
- Review of existing studies carried out in the Derrygreenagh area;
- Meetings and discussions with Offaly County Council representatives; and
- Consultation with statutory bodies and interested parties.

1.4 Consultations

Various statutory bodies and other organisations were consulted regarding the proposed development. The consultation letter and scoping report that was circulated to these consultees is included in Appendix 1B *Consultation Letter* and a list of all consultees is appended as Appendix 1C *List of Consultees.*

Submissions regarding the development and the scope of the environmental impact assessments were received from a number of relevant statutory bodies and other organisations as detailed below:

- An Taisce;
- Department of Environment, Heritage and Local Government;
- Heritage Office, Offaly County Council;
- Eircom;
- Geological Survey of Ireland;
- Eastern Regional Fisheries Board;
- National Parks and Wildlife Service;
- Planning Department, Westmeath County Council;

- Planning Department, Offaly County Council;
- Vincent Wildlife Trust;
- Water Services, Offaly County Council;
- National Roads Authorities Regional Design Office;
- National Roads Authority;

Submissions and comments received from statutory bodies and interested parties were considered throughout the design phase of the power plant development and preparation of the EIS. Written responses are included in Appendix 1D *Consultation Responses.*

Two public consultation events were also held in order to inform the local population of the proposed development at Derrygreenagh. These public consultations were undertaken at the two closest population centres to the proposed development site as follows:

- Rhode on October 22nd 2008.
- Rochfortbridge on October 23rd 2008

The Public Consultation Brochure is appended in Appendix 1E *Public Consultation Brochure.* In order to keep the public informed of progress on the development of this project, a page on the Bord na Móna website was created, which will be kept updated during the entire duration of this project, from pre-planning consultation up to the commissioning of the plant.

2 Background to the Project

2.1 Need for the Facility

Security of electricity supply is identified as crucial for the economy in the Government White Paper entitled *Delivering a Sustainable Energy Future for Ireland* (*Energy Policy Framework 2007 – 2020*). The paper highlights the need for robust electricity networks and electricity generating capacity to ensure consistent and competitive supply of energy. A key policy objective is the enabling of competition and delivery of consumer choice through structural change.

The above mentioned paper also highlights the need for additional electricity generating capacity and the improved availability of existing generating plant. It outlines Ireland's current external dependence on the supply of primary energy, 91% in 2007, its comparatively high level of greenhouse gas emissions and draws attention to the need for fuel diversity in power generation.

The Government's White Paper indicates a target of 33% of electricity to be generated from Renewable Energy Sources (RES-E) by 2020. This renewable target was increased to 40% of the electricity consumed in 2020 by the Minister for the Environment, Heritage and Local Government in his Second Carbon Budget delivered to the Oireachtas on 15th October 2008.

The bulk of this renewable generation capacity will be provided by wind, perhaps as much as 90%. It is clear that wind energy is at the heart of Government policy on the significant contribution of renewables to future energy requirements for Ireland. While the increasing levels of wind penetration will make a valuable contribution to fuel diversity, sustainability and emissions reduction, there are issues surrounding the reliability of supply resulting from wind generated electricity. The intermittent nature of wind means that the contribution of wind power is variable over time. As a consequence, even though up to 6,000 MW of wind capacity may be installed on the national grid by 2020, a considerable amount of flexible thermal generating plant will also be required. This is necessary to provide system reserve and backup capacity for periods of low output from wind generators, in order to maintain an adequate security of supply standard.

Gas turbine generating plant can provide the level of flexibility required to ensure system security standards are met, where high levels of wind generation are connected to the system. The operating profile for a generator which primarily provides electricity during the day and evening time and switches off during the night when demand is low, is termed “mid-merit”. This term indicates the relative marginal cost of electicity generated by such a unit, which is between lower cost alternatives such as wind power, and higher cost options such as distillate peaking plants, Where this type of plant operates to complement wind, by switching on and off at different times of the day, it is referred to as a flexible mid-merit generating unit.

Existing “base load” power plants on the network, such as coal and peat units, were primarily designed for continuous base load operation and have limited flexibility to turn down and/or cycle on and off on a daily basis. In addition, the existing oil-fired units, that currently principally operate in a mid-merit operating mode, are ageing rapidly and are expected to close by the middle of the next decade, when new limits for emissions from large combustion plants take effect. As wind becomes the new base load technology, flexible gas turbine plant will increasingly be required to complement the wind generated power output. In order to perform this role in an optimum manner, this flexible plant needs to be capable of:

- Starting and stopping on a daily basis, with up to 250 starts per annum without any significant impact on plant availability;
- Starting up quickly;
- Ramping up and down quickly to follow variations in demand;
- Having a low minimum stable generating level.

Open cycle gas turbines (OCGT) alone could fulfil this need, as they are capable of starting rapidly and ramping up and down quickly to follow variations in demand. However, they are generally relatively inefficient with typical efficiencies ranging from 33 - 36%. This compares with larger CCGT unit where overall efficiencies range from 54 – 58%. This means that the use of OCGT units results in higher relative operating costs and higher greenhouse gas emissions if operated for long periods of time. However the OCGT units are suitable for operation over short periods to meet peak demand when other generation supply is limited.

Flexible CCGT units are capable of a large number of starts per annum, and are ideally suited to operate in a “mid-merit” mode to support increased wind penetration onto the grid, and they also confer significant benefits to the system in terms of lower costs and greenhouse gas emissions.

Bord na Móna's proposed development at Derrygreenagh comprises a *c.* 430 MW flexible CCGT unit and a c. 170 MW reserve/peaking OCGT unit. In general, the flexible CCGT unit 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. The OCGT unit will sit in reserve, but be capable of a fast start to meet demand at peak times and when generation supply is limited or constrained.

The *Generation Adequacy Report 2009 – 2015,* produced by Eirgrid, outlines the predicted electricity demands for the island of Ireland during the years 2013 2014 and 2015. It is estimated that the electricity demand for 2013 will be in the region of 43 TWh, with a peak demand of approximately 7,571 MW. A slight increase in demand is expected between 2013 and 2015, with the electricity demand for 2015 estimated at 45 TWh and peak demand of approximately 7,946 MW.

Based on a conservative estimate of demand growth beyond 2015 of 2% per annum, it is estimated that peak demand by 2020 will be almost 9000 MW, with total demand close to 50 TWh. This level of total demand does not yet take into account the increase that will be driven by the recently proposed plan to electrify up to 10% of the national car fleet by 2020.

Given the age profile of the existing plant on the system in Ireland, the current level of power plant availability and impending power plant retirements, a significant programme of new power plant builds are required in the medium term to maintain an adequate security standard. This new build must complement the level of wind penetration required to ensure the Government's 40% RES-E target is achieved.

2.2 Main Alternatives Considered

In the selection of the optimum plant type for the proposed development a number of factors were considered. The principal factors were:

- Unit size required to meet growing electricity demands;
- Efficiency of the unit in converting primary energy into electrical energy;
- Proven technology and reliability;
- Flexibility of the plant to operate efficiently at different loads;
- Site area constraints, such as planning, environmental or technical constraints;
- Proximity to a steady and secure primary energy source;
- Proximity to a significant electrical and/or heat load centre; and
- Local infrastructure.

Considering the above-mentioned factors, a number of alternative technologies were considered for two generic plant types:

1. A flexible mid-merit generating unit

2. A peaking/reserve generating unit

The assessment of alternatives, and other technical, environmental and financial studies, determined that a *c.* 430 MW CCGT flexible mid merit unit and a *c.* 170MW OCGT peaking plant would be the optimum choice for this particular installation.

2.3 Alternative Sites Considered

A three-tier approach was taken to the selection process when considering a suitable location for the proposed power plant development. The site selection process consisted of:

- Tier 1: Regional Site Selection;
- Tier 2: An Assessment of alternative sites within the Athlone-Tullamore-Mullingar Gateway, as defined by the National Spatial Strategy; and
- Tier 3: A more detailed appraisal of locations within the selected zone.

2.3.1 Tier 1: Regional Site Selection

The principal criteria utilised in assessing the primary areas were:

- Was there a history of power generation in the area?
- Was there a supply of natural gas at high pressure?
- Was there a high voltage transmission network in close proximity?
- Was there adequate surface or ground water to support water cooling?
- Was it a densely populated area?
- Did Bord na Móna own the land?

On balance, particularly considering the gas and power grid infrastructure, it was decided that the Derrygreenagh area offered the best potential for developing a 600 MW power plant development. In the absence of sufficient available water resources to allow water cooling at the facility, air cooling is considered the most appropriate method of cooling for the proposed power plant.

2.3.2 Tier 2: An Assessment of alternative sites within the Athlone-Tullamore-Mullingar Gateway

It was considered appropriate to examine the possibility of locating the proposed power plant development at a location owned by Bord na Móna within the Athlone-Tullamore-Mullingar Gateway.

Most of Bord na Móna's landholdings lie outside the geographic triangle of the Gateway: the Mountdillon Group of bogs, which supply Lough Ree power station, lie to the north west; the Derrygreenagh Group of bogs, which supply Edenderry power station, lie to the east; and the Boora/Blackwater Group of bogs, which supply West Offaly power station, just border the triangle on the south west.

Bord na Móna therefore has very limited landholdings lying within the Gateway triangle. Areas of peatland which just fall within the triangle include Bunahinly Bog, Co. Westmeath and Bellair Bog, Co. Offaly: However, after consideration of these sites it was concluded that neither of these sites were suitable for the location of the proposed power plant development.

2.3.3 Tier 3: Site selection within the Derrygreenagh area

Three potential sites for the proposed development were appraised within the overall Derrygreenagh area. See Figure 2.1 *Locations Assessed Within the Derrygreenagh Area*;

- Drumman Bog: A cutover peatland area, lying to the north east of the R400, with access from the roadway leading to a sand/gravel quarry;
- Derrygreenagh: The existing Bord na Móna office and workshop site located on the northern side of Derrygreenagh Hill, with direct access from the R400;
- Derryarkin Bog: A cutover peatland area, lying to the south west of the R400, with a new access roadway from the R400.

The principal criteria used in appraising these alternative location options were:

- Was it a brownfield or greenfield site?
- The existing ground conditions;
- The ease of access;
- Proximity to the nearest neighbours; and
- Visual impact.

On assessment of the potential sites using the criteria listed above, it was decided that the Derrygreenagh Hill location offered the best site option, particularly in relation to ease of access, ground conditions and minimising visual impact.

2.4 Connection to the National Grid and Gas Network

The proposed development will require the construction of an overhead transmission powerline to connect the power plant to the National Grid, which is operated by Eirgrid, to allow for the supply of generated electricity to the market. In addition, as the primary fuel to run the units is natural gas, a connection to the gas network is also required.

This planning application does not cover a connection to either of these networks, as the processes involved in connecting to these networks is significantly in the control of the network management companies. In the case of a connection to the national grid, a separate planning application by Eirgrid is required.

3 Description of the Development

3.1 Existing Environment

The proposed development site is located at Derrygreenagh, Co. Offaly approximately 2.2 km south of Junction 3 on the M6 motorway for Rhode and Rochfortbridge. The site is located on the R400 road as shown on Figure 1.1 *Site Location.* The proposed development site is located on a "mineral island" with the Drumman and Derryarkin cutaway peatlands to the east and west, respectively.

The mineral island consists primarily of the existing Bord na Móna Derrygreenagh works and Bord na Móna Energy Headquarters, with a small area of privately owned agricultural land at the southern extent of the mineral island, which lies outside the proposed development boundary. The buildings and structures on the existing site are detailed in Figure 3.1 *Existing Site Layout*. The Bord na Móna Works operations consist primarily of the repair and modification of machinery used for the harvesting and transport of peat from the nearby bogs. There is a narrow gauge railway also traversing the site. The operations associated with the Bord na Móna Works have been scaled back over the last number of years due to reduced peat production in the areas surrounding the site following the closure of the Rhode peat fired power plant. The existing operations at the Derrygreenagh site will be relocated prior to the construction of the power plant. To the west of the R400, there is currently a pilot biofuel processing facility which will be removed prior to the commencement of the proposed development. All existing buildings on the site will be removed prior to the construction of the proposed power plant.

All land to be used for the proposed development is in the full ownership of Bord na Móna. The proposed development occupies a total area of 25.4 ha. The site occupies an area of 22.8 ha with the main site occupying an area of 17.5 ha and the adjacent switchyard site on the western side of the R400 roadway, occupying 5.3 ha. The proposed discharge pipeline to the Yellow occupies an area of 2.6 ha. Refer to Figure 3.2a-f *Proposed Site Layout* for the extent of the development area.

Derrygreenagh and the surrounding areas are characterised by very low density residential development, mainly comprising of scattered one off housing and farmhouses. The closest dwelling is located approximately 1.1 km to the south east of the site on the Knockdrin road. The one off housing on this roadway represents the most significant concentration of residents in proximity to the site. Further individual one off housing is also present along a link road from the Knockdrin Road to the R400, along the length of the R400, particularly in the vicinity of Rhode, and on the northern end of the road approaching the M6 motorway. In total there are 19 residential houses within 2 km of the proposed development site.

The nearest town to the proposed development site is Rochfortbridge, Co. Westmeath which is *c.* 4 km north east of the site, whilst Rhode, Co. Offaly is *c.* 6 km south west of the site - see Figure 1.1 *Site Location.*

3.2 Scheme Description

BNME intends to develop a power plant consisting of two separate units at the Derrygreenagh site as follows:

- A *c.* 430 MW Combined Cycle Gas Turbine (CCGT) unit and
- A *c.* 170MW Open Cycle Gas Turbine (OCGT) unit

The primary objectives of the proposed development are to:

Sell electrical power through the EirGrid high voltage transmission system.

Provide a flexible power plant capable of responding on a daily basis to variations in electricity demand and the variability of supply from wind based electricity generation.

Provide a peaking plant in order to provide reserve capacity and also to meet peak electricity demand, with the capability to turn on and off at short notice.

Increase the electrical generating capacity in Ireland by 2012, to meet the anticipated increase in system demand.

Reduce the proportion of greenhouse gas emissions per MWh of electricity generated by the use of high efficiency plant, thus contributing to Ireland's objectives in complying with its obligations under the Kyoto Protocol.

Provide an efficient power generation facility at Derrygreenagh where efficiencies will result from significant synergies, in terms of the construction, operation, maintenance and the procurement of fuels, in operating two types of power generating units on a single site.

The proposed power plant development at Derrygreenagh will use the latest technology gas turbine units to meet the above objectives.

3.2.1 Combined Cycle Gas Turbine (CCGT) unit

The CCGT unit will typically operate on a two shift basis, with anticipated annual running hours in the range 4,000 – 6,000 hours per annum, and with an expected long-term availability of 92%. The CCGT unit will incorporate the following process:

- A gas turbine burning natural gas will drive a generator for electricity production.
- Exhaust gases from the gas turbine will pass through a heat recovery steam generator (HRSG) to generate high-pressure steam.
- The steam generated in the HRSG will drive a steam turbine, which will also drive the generator to provide additional electrical power.
- This steam is then fed to the Air Cooled Condenser (ACC) where it is condensed back to water and fed back to the HRSG to generate more steam thus conserving water in a closed cycle.

3.2.2 Open Cycle Gas Turbine (OCGT) unit

The OCGT unit will operate as a reserve/peaking plant, with anticipated running of approximately 200 - 500 hours per annum, and an expected long-term availability of 98%. The OCGT unit will incorporate the following process:

- A gas turbine burning gas or distillate will drive a generator for electricity production.
- Exhaust gases from the gas turbine will be released directly to atmosphere through an exhaust stack.

3.2.3 Common Site Elements

A number of site elements are proposed which will serve the site as a whole. The main site elements are as follows:

An Eirgrid substation: A substation will be located on the site to allow for a connection from the site to the local high voltage transmission network, as determined by EirGrid.

- ***An above ground natural gas installation (AGI):*** Natural gas will be supplied from the Bord Gáis Networks (BGN) gas network at a minimum guaranteed pressure of 19 barg at 15^{o}C. The design maximum pressure of the BGN gas pipeline is 70 barg. The gas will pass through a gas conditioning plant located in the AGI compound on the site.
- ***Water treatment plant and storage tanks:*** An on site water treatment plant will be required, where water for use in the HRSG and the gas turbines will be demineralised to achieve a high purity. 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 or alkali addition as required. Once treated, water will be held within three water storage tanks with a combined capacity of 21,000 m^3.
- ***Process water discharge tank:*** The process waste water will be collected and treated in a 1200 m^3 below ground concrete discharge tank from where its quality and temperature will be monitored prior to discharge. The tank comprises of a number of chambers. Waste water is fed into the inlet chamber via process drains. The waste water is pumped from the inlet chamber into two aeration chambers where air is bubbled up through the process waste water in order to reduce the temperature. The waste water overflows from these chambers into a small treatment chamber where an agitator mixes the waste water. pH is measured and controlled by automated dosing with either acid or base, as required, to regulate the pH within a range of 6 to 9. The water then overflows from this chamber into the final main discharge chamber. Dissolved oxygen, pH, conductivity and temperature will be continuously monitored and, if the wastewater falls outside of the thresholds set by the Environmental Protection Agency (EPA) in the Integrated Pollution Prevention and Control (IPPC) Licence the water will be fed back to the aeration chambers. If the wastewater is within the prescribed limits the waste water will be pumped to the discharge point.

- ***Surface water attenuation tank(s):*** Surface water arising from the main site, the location of power plant, will be collected in a below ground 2,600 m^3 concrete attenuation tank; whilst any surface water generated from the adjacent western site will be collected in a below ground concrete attenuation tank with a minimum capacity of 388 m^3. All surface water runoff will be directed to the tanks via hydrocarbon interceptors and silt traps. Surface water run-off will be discharged to the Mongagh River in accordance with Sustainable Urban Drainage System (SUDs) guidance.

- ***Distillate storage tanks:*** There is a condition in the "Licence to Generate" issued by the Commission for Energy Regulation (CER), which requires certain generators to maintain a minimum quantity of distillate back-up fuel on the site. This condition is known as the Secondary Fuel Obligation. This obligation applies to all gas turbine generating units. The resulting total storage capacity for distillate fuel required on this site, allowing for an operating margin, will be 15,000 m^3. Distillate will be stored in three vertical cylindrical steel tanks, within a 110% capacity bund to comply with IPPC licence requirements. The distillate will be delivered to the site by road tankers.

- ***Bulk chemical storage:*** Processes in the water treatment plant will utilise acid and alkali, both of which will be delivered by road tanker and stored on site in bunded storage tanks. A range of specialist chemical treatment options are available for boiler feedwater. These include the use of passivation chemicals for pH control and the use of oxygen scavengers. These chemicals will be stored on site in bunded designated areas in the Boiler Dosing Building. Oils and greases used for the lubrication of the main mechanical components will be changed on a regular basis. Oils and greases will be delivered in drums by HGVs, and will be stored in a designated bunded oil store.

- ***Proprietary foul water treatment system:*** Foul water, which consists of waste water other than process waste water and surface water, will be treated in a proprietary secondary treatment system prior to discharge. It is considered that the treated wastewater will be discharged to the Yellow river. However the option of percolating to ground will also be considered at detailed design stage on foot of a site suitability assessment, including percolation testing, which will be undertaken to determine the suitability of the topsoil and subsoil layers for this purpose. It is anticipated that up to 2,100 litres /day of treated foul water will be discharged with an anticipated 20 mg/l BOD and 30 mg/l SS (suspended solids).

- ***Site buildings*** will include an administration building, a workshops and stores.

- ***Internal roads and parking:*** Internal roadways are designed to allow for safe access to and egress from the site, whilst ensuring that pedestrians using the site are protected. The internal roads and parking facilities were subjected to a road safety audit (RSA), and modifications were made to the design to ensure suitable signage and road markings, sufficient lighting and adequate turning facilities, as required by the RSA.

3.2.4 Construction of the Proposed Development

It is expected that construction will commence in early 2011. Civil, mechanical, electrical works and commissioning of the plant are expected to last for approximately 38 months. Construction activities are expected to peak from January 2011 to October 2011.

Normal working hours during the construction period are expected to be Monday to Friday 07.00 to 19.00 and Saturday 08.00 to 16.30. During certain stages of the construction phase it is expected that some work will have to be carried out outside of normal working hours, however this will be kept to a minimum. Construction works with a significant noise impact will be avoided outside of normal working hours.

BNME will ultimately be responsible for the management of all commercial, operational and regulatory issues associated with the site during both the construction and operational phases.

During the construction phase BNME will employ a technically competent Contractor, who will have responsibility for all aspects of day to day operations on site. Construction activities have the potential to create a nuisance and cause disruption. In order to minimise the disruption caused, a Construction Environmental Management Plan (CEMP) will be developed and implemented during the construction phase. The CEMP will provide a framework for the management and implementation of construction activities incorporating the mitigation measures identified in the relevant chapters of this EIS. The CEMP will be reviewed regularly and revised as necessary to ensure that the measures implemented are effective.

Prior to commencement of operations, BNME will recruit and train a suitably qualified and technically competent operations and maintenance team, who will have responsibility for the manning and day to day operation and maintenance of the plant, as well as monitoring and reporting on emissions. The management team will be experienced in the day to day operations and maintenance of power generation plants similar to the proposed development, and will report directly to the BNME Power Generation business unit senior management. All major items of power generating plant will be covered by long term service agreements, to ensure safe and efficient plant operations.

3.3 Regulatory Control

During the operational phase of the proposed development the facility will be regulated by the following authorities, as detailed below:

- Environmental Protection Agency (EPA).
- Health and Safety Authority (HSA).
- Commission for Electricity Regulation (CER).

The facility will also have to operate within the provisions of a number of codes applicable to the electricity sector, such as the transmission system Grid Code and the Single Electricity Market Trading and Settlement Code.

4 Human Beings and Material Assets

4.1 Methodology

The methodology on which the assessment of human beings in the vicinity of the proposed development was undertaken comprised essentially of a desk-based assessment, where information regarding recent trends in population, employment, tourism, transport, amenities, public utilities and land use was assessed. The required information about population and employment has been obtained from the Central Statistics Office (CSO). The County Development Plans for Offaly and Westmeath also provided information on the socio economic context of the study area.

4.2 Assessment Conclusions

During the peak construction period, which is expected to last 10 months from Jan 2011 to Oct 2011, the proposed development will employ up to 450 workers. This is a significant positive short-term impact for the local economy of the area. This increase in population will positively impact on businesses in surrounding settlements that will provide workers with services, including accommodation, food, entertainment, etc., creating further employment opportunities in the local service industry.

Inevitably there will be short-term negative impacts during construction due to increased noise, vibration, traffic and dust. Negative landscape and visual impacts will occur, arising from proposed plant and activities on site. However, these will cease following completion of construction. During the construction period a Construction Environmental Management Plan (CEMP), incorporating mitigation measures for reducing dust, noise and vibration, will be implemented in order to minimise any impacts on the receiving environment. Overall, construction phase impacts are considered to be slight and temporary in nature in terms of any impact on the socio-economic environment.

During the operation of the proposed power plant, it is considered that there will be a significant positive impact on the local and national economy. Significant positive impacts will arise, due to the employment opportunities that will be created by operating the power plant, the improvement to public utilities through the generation of additional electricity and the support provided for the increased penetration of renewable electricity which will result.

The impacts of the proposed power plant on the property market were considered. Evidence from areas surrounding other power plants in the midlands suggests that there will be no negative impact on the property market arising. House prices in an area are influenced by market conditions, and it is considered that the creation of employment will lead to an increased demand for property in the area. Given the low density residential development that occurs in this area, it is considered that the impact of the proposed development on the property market will be insignificant. There is a positive perception of power generation in this area and, during the public consultation for the proposed development, the response from the local community was positive.

The quantity of distillate to be stored at the site results in the site being considered a lower tier Seveso site as defined under the *European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations, 2006.* As a result of the above mentioned designation, there was a requirement to generate a Major Accidents Hazards Report and submit the same to the Health and Safety Authority (HSA). The worst case potential accidents have been modelled, using pessimistic modelling assumptions. It was concluded that, given the significant distance of the site from sensitive receptors, there is no appreciable risk to the general public from the activities on the site.

4.3 Mitigation Measures

In order to control potential negative impacts during the construction phase, a *Construction Environmental Management Plan* (CEMP) will be developed and implemented by the nominated Contractor during the construction phase of the project.

It is not anticipated that any specific mitigation is required during the operational phase regarding the socio-economic context discussed in this section.

5 Flora and Fauna

5.1 Methodology

An ecological assessment comprising a habitat and flora survey was conducted for the proposed development at Derrygreenagh, Co. Offaly. The aquatic habitats in the survey areas along the Yellow River were also assessed to determine the baseline ecological status of this river. A desk study was undertaken to collate the available information on the ecological environment. The National Parks and Wildlife Service (NPWS) database was also researched to determine if any protected species occur on or in the vicinity of the site. The Department of the Environment, Heritage and Local Government (DEHLG), the Eastern Regional Fisheries Board (ERFB) and the local conservation officer (NPWS) were consulted in relation to the flora and fauna present in the area, and with particular reference to any potential impacts on flora and fauna arising from the proposed development.

5.2 Assessment Conclusions

According to the NPWS database and consultation with the NPWS, there are no rare or protected plant species recorded from the site.

The site is not contained within a designated conservation area. The closest designated conservation area is located to the north of the site – Milltownpass Bog NHA. Other designated conservation areas within a 10 km radius include: Raheenmore Bog pNHA and SAC, Grand Canal pNHA and Black Castle Bog NHA.

During the construction phase, the primary impact on flora and fauna will be the loss of onsite habitats which are generally of low ecological value. The impact of the proposed development will be permanent and 'minor negative'. The area of grassy meadow to the south of the site is calcareous in nature and supports orchids. It will be removed as a result of the proposed development. However, due to the relatively small area in which the orchids were found, the impact is not considered significant.

The potential exists for a range of pollutants to enter watercourses during construction, such as suspended solids, sediment, uncured concrete and grouts, fuels, lubricants and hydraulic fluids. These pollutants would all have deleterious effects on macroinvertebrate species and fish species if allowed to enter watercourses. However, the macroinvertebrate habitat value of the Yellow River is considerably depleted, due to the historical and ongoing channelization and management of this river. The potential loss of fish habitat resulting from the proposed development is considered slight, as there is limited habitat available for salmonids at the discharge location. However, lamprey were recorded from the proposed discharge site on the Yellow River, and further mitigation measures will be required in order to protect this species.

The removal of hedgerows and treelines within the site is considered to be a permanent moderate negative impact on flora and fauna. The mature trees to the south and north of the site provide foraging and commuting routes for bat species and the treeline to the south of the site may provide roosting sites for Leisler's bats. However, it is not proposed to remove any of these trees.

A short term negative impact will arise during construction, due to increased noise from machinery which will deter fauna from the vicinity of the site. There is potential for significant dust generation during both the demolition of the existing structures on site and the construction of the development. This may adversely affect flora and fauna in the vicinity of the development, resulting in minor negative short-term impacts on flora and fauna.

During the operational phase of development, impacts will include increased noise impacting on bats, birds and animals in the area, which may tend to avoid the general area. Increased lighting on site will also deter birds and mammals from using the site.

An indirect impact arising from the proposed development could potentially involve changes in the hydrology of the river, which would result in alterations to peak and minimum flow rates and erosion/deposition patterns, thus impacting on the existing aquatic habitats within the Yellow River. However, with the average quantity of process water to be discharged is estimated at 250 m^3/day, and an alternative scenario representing the maximum potential process water effluent discharge of of 360m^3/day, the risk of significant alterations in the flow patterns in the Yellow River are not considered likely.

Assimilative capacity calculations were conducted to assess the impact of the process water during normal operation and during blow down. The Yellow River has sufficient assimilative capacity for predicted BOD, Total Suspended Solids, Total Dissolved Solids and Ammonia discharges. However, the background concentration of ortho-phosphate in the Yellow River was found to be elevated. The target ortho phosphate median level for the Yellow River is 0.03 mg/l, and the median background concentration, based on the water quality data received, was 0.09 mg/l. There is expected to be a very slight increase in ortho-phosphate in the Yellow River as a result of the process water discharge, due to the dilution of background ortho-phosphate levels in the stream with the dilute effluent.

5.3 Mitigation Measures

The operation of the power plant development will comply with specified air quality limits in order to protect ecosystems and vegetation.

Due to the proximity of the dry calcareous heath and immature woodland to the site boundary, measures should be put in place to minimise any incursion from machinery or construction workers during the construction phase. The site boundary should be marked with high visibility tape and workers and machinery should not be allowed in this area.

The removal of trees and scrub shall not take place during the bird breeding season, from March 1st to August 31st, in order to protect nesting bird species. Swallows were found nesting in two of the existing buildings, and it is recommended that demolition of these structures should take place outside of the bird nesting season, from March 1st to August 31st, to avoid impacting on these nesting birds.

Although no roosts were identified within the site during the ecological assessment, the installation of bat boxes is recommended to offset the loss of potential bat roosting habitat in buildings. As bats are protected under the Wildlife Act, an appropriately qualified ecologist will be engaged, during demolition of the buildings on site, to inspect the buildings immediately prior to demolition to ensure that bat roosts or hibernating bats are not impacted by the works. Any removal of bat roosts or hibernating bats will be done under licence from the NPWS. Where possible, demolition should be carried out outside the bat hibernating season, from November to March.

During the excavation and removal of soil for construction works, fuel/oil interceptors and silt traps or sedimentation ponds will intercept surface water run-off. The Contractor will establish a maintenance schedule, and operational procedures for silt and pollution control measures during the construction period, which will be incorporated into the Construction Environmental Management Plan (CEMP) for the proposed development.

Oil, petrol and other contaminants will be stored in bunded containers. All waste oil, empty oil containers and other hazardous wastes should be disposed of in conjunction with the requirements of all relevant legislation.

Pouring of concrete will take place in designated areas, washings will not be discharged to surface water, and poured concrete will be allowed to cure for 48 hours in the dry. A dust minimisation plan will be implemented during the demolition and construction works, in order to prevent dust emissions impacting on the flora and habitats of the surrounding area.

In order to protect Salmonid species, no instream works shall be undertaken in the watercourse during the period October to May. The presence of lamprey in the Yellow River requires additional mitigation with regard to the timing of works. Lamprey spawn from late April to early June and the young of each year will settle on fine, silty substrate where they will shelter and develop. These juvenile lamprey remain in the silt throughout the year and will require translocation should their immediate habitat require removal. The translocation of lamprey can only be carried out by a suitably qualified ecologist under licence issued by the Department of Communications, Marine and Natural Resources.

The proposed landscaping mitigation shall use native species of local provenance where possible. Any soils excavated from the site during construction should be re-used on site where possible for landscaping.

6 Water Quality

6.1 Methodology

A desk-based assessment was conducted to determine the baseline dataset of water quality and hydrology for the receiving environment in the vicinity of the proposed development. The issues discussed include surface water run-off, foul water, process wastewater and the location of the discharge point. The required information on water quality was obtained from the Environmental Protection Agency (EPA), Offaly County Council, Westmeath County Council and the Eastern Regional Fisheries Board.

Assimilative capacity calculations were undertaken to determine the suitability of the Yellow River to accept treated effluent from the proposed development.

6.2 Assessment Conclusions

There are two rivers in relatively close proximity to the proposed development site. The Mongagh River is located approximately 0.7 km north of the site with the Yellow River is located approximately 1.4 km to the south of the site. See Figure 6.1 *Watercourses in proximity to the proposed Development Site.*

Three distinct waste water streams will be discharged from the site: process waste water, surface water run-off and treated foul water from sanitary facilities, wash rooms, mess rooms etc. Consultations were conducted with the Eastern Regional Fisheries Board, Offaly County Council and Westmeath County Council regarding the selection of an appropriate discharge point for waste waters. It was determined that the Yellow River is the most suitable discharge location for waste water effluents from the site.

It is proposed to discharge process wastewater to a discharge point on the Yellow River, following treatment and monitoring of effluent quality to ensure it complies with the limits set in the IPPC licence. The average quantity of process wastewater to be discharged from the proposed power plant is estimated at c. 250 m^3/day, up to a maximum of 360 m^3/day. The operation of the CCGT unit will be optimised to minimise boiler blow-down.

Surface water runoff will be generated from all surfaces within the facility which are exposed to rainwater, or to which water is applied in order to clean them. In general, surface water runoff results in clean water which is not contaminated. However, there is potential for surface runoff water to come in contact with contaminated material on the site, particularly in areas used for the storage or handling of contaminants. The majority of hardstanding will be channelled towards a below ground concrete attenuation tank. Certain hardstanding areas, such as the transformer and distillate storage bunds, will require surface water to be pumped from these bunded areas. This surface water will be pumped through free-flowing channels and an oil/water interceptor to the attenuation tank, thus mitigating against accidental release of spillages to the attenuation tank.

All chemical storage areas will be covered and bunded to control potential losses of contaminants. These bunded areas will require surface water to be manually pumped to the process water tank for treatment, where required. However, as these areas are covered, there will be minimal surface water generation from these areas. Any surface water collected within the attenuation tank will be discharged, via a pipeline and open drain, to a discharge point on the Mongagh River.

It is proposed that all foul water, consisting of sewage and domestic type waste water, emanating from the site during the operational phase will be treated in a proprietary secondary treatment system prior to discharge. It is considered that the treated wastewater will be discharged to the Yellow river. However the option of percolating to ground will also be considered at detailed design stage on foot of a site suitability assessment, including percolation testing, which will be undertaken to determine the suitability of the topsoil and subsoil layers for this purpose. It is anticipated that up to 2,100 litres / day of treated foul water will be discharged, with an anticipated 20 mg/l BOD and 30 mg/l suspended solids.

There are potentially significant, short-term, negative impacts on the receiving waters during the site clearance and construction phases. These relate to the release of sediment and other contaminants to the Mongagh River, via drainage channels, as detailed below:

- Potential contaminants associated with any civil engineering works include those associated with materials to be used during the construction process. Such materials include cement, which can run-off to receiving waters.

- Chemical contamination could also occur from accidental spillages, such as oil and other chemicals through poor operational management, the non-removal of spillages, poor storage, handling and transfer of oil and chemicals.

- Potential exists for the release of suspended solids to receiving drainage channels, particularly during the site clearance phase. Escape of inert solids to waterways, as a result of exposed ground, stockpiles of soil, plant and wheel-washing, may give rise to water pollution.

The predicted effects of the construction phase on surface water quality in the locality are expected to be negligible or at most slight and short term.

6.3 Mitigation Measures

A technically competent Contractor will be employed by Bord Na Móna Energy to manage on-site construction activities. The Contractor will be required to develop a Construction and Environmental Management Plan (CEMP), which will include a Water Management Plan, to ensure that contaminants listed above do not impact on the local water resources.

Operational phase mitigation measures relate to surface water run-off, discharge water, foul water and water supply:

- An assimilative capacity assessment was undertaken to determine the capability of the Yellow River to assimilate the proposed discharge. Limits for process wastewater discharge will be determined by the EPA under the IPPC regime. A water quality monitoring programme will be developed for process wastewater and for surface water run-off. Monitoring of the receiving water body upstream and downstream of the wastewater discharge point will be undertaken, on a quarterly basis, to determine the impact of the discharge on the receiving water;

- A *Sustainable Urban Drainage System (SUDs)* approach has been taken in order to assess the potential surface water run-off arising from the proposed development. Surface water generated will be directed towards suitably sized attenuation tanks, prior to discharge to adjacent drainage channels, at a maximum flow of no more than 70.4 l/s. This system will ensure that surface water run-off generated from the site is separated from any hydrocarbon contaminants or grit that it may come into contact with on site.

- All bunds and chemical containers will comply with the appropriate standards. All bunds will be leak tested prior to commencement of operations, and every five years thereafter;

- In the event that a decision is taken to investigate the possibility of discharging treated domestic effluent from the on-site secondary treatment system to groundwater, a site suitability assessment will be completed in accordance with the relevant guidance; and

- The discharge water pipeline will be leak tested periodically.

7 Soils, Geology and Hydrogeology

7.1 Methodology

The baseline information that is detailed in this section describes the baseline drift geology, hydrogeology and bedrock geology of the study area and was obtained from publicly available information. The Geological Survey of Ireland (GSI) database and maps were consulted for information on the geology of the study area in terms of soils, geology, aquifer classification and vulnerability.

The proposed development will require the abstraction of significant volumes of groundwater for process water. A preliminary ground investigation was undertaken at the site to establish ground conditions, to determine the sustainable yield available from the groundwater resource under the site and to investigate ground conditions and groundwater quality at the site. An assessment was also undertaken to determine the existence or otherwise of contamination at the site.

7.2 Assessment Conclusions

Bedrock and Quaternary maps show that the solid geology of the site consists of argillaceous and cherty limestone and shale. The drift deposits on site consist of isolated areas of peat deposits underlain by sand and gravel. Peat has been stripped from the surrounding area and the site itself is generally located on a ‘mineral island’, and peat is shown to be present in only the north east corner of the site. Made Ground and Carboniferous limestone till are also present on parts of the site.

A Geological Heritage Area is one which contains geological or geomorphological features considered to be of national interest and recommended for Natural Heritage Area (NHA) designation by the GSI, under the Wildlife (Amendment) Act 2000. There are no geological heritage areas currently in or near the site.

The ground conditions show large variation across the site. The general stratigraphy encountered over the site was as follows; 'Made Ground', peat and soft clay/ silts, glacial clay, weathered limestone and karst clays.

The aquifer underlying the site is of local importance, in which the bedrock is moderately productive only in 'Local Zones'. The groundwater vulnerability, the ease with which groundwater may be contaminated by human activity related to the intrinsic geology and hydrogeological characteristics of the area, is classified as being Moderate.

The result of a well search of the GSI databases (2007 dataset) indicates that, apart from the existing borehole which currently supplies water to the site, the nearest recorded groundwater abstraction well is located approximately 1.3 km from the site. The nearest Source Protection Area is approximately 4 km north west of the site.

Information obtained from the Radiological Protection Institute of Ireland indicates that the site is located in a High Radon Area.

Potential sources of contamination have been identified following the ground investigation. Following the discovery of potential contaminants during the site investigation survey, the Environmental Protection Agency has been informed of the same. The risk to human health and to groundwater, arising from contamination at the site, has been categorised as "low risk" following the implementation of appropriate mitigation.

The generation of dust could temporarily affect neighbouring sites and site users. It should be noted that dust suppression/minimisation will be incorporated into the Construction Environmental Management Plan (CEMP), given the nuisance and irritant factor which can arise from elevated dust levels in the atmosphere.

Runoff from construction sites can contain high levels of entrained sediments or other water pollutants, dependent on the nature of contamination sources on the site, which can generate contaminated surface water run-off.

Excavations on-site, as part of the construction phase, may require the disposal of exposed groundwater. This groundwater will be treated in advance of discharge to adjacent watercourses, in agreement with the Eastern Regional Fisheries Board. Such waters will be treated, e.g. by the use of sedimentation ponds, to ensure that they pose no risk of pollution to the receiving watercourses.

Water for the power plant will be provided from a borehole located at the eastern side of the site. As part of the hydrogeological assessment of the site, a pumping well was drilled and tested. The pumping tests indicated that a sustainable yield, of 630 m^3/day, could be obtained from the aquifer underlying the site. An assessment undertaken has concluded that there is a sufficient quantity of water available from the aquifer, in addition to proposed water storage capacity at the site, to allow for the operation of the power plant under any scenario without negatively impacting on the groundwater resource. It was also concluded that the abstraction of groundwater will have no impact on ground levels and ground stability beyond the extent of the site boundary, and will not impact the R400 roadway. In addition, the abstraction of groundwater will not have a significant effect on the abstraction of groundwater from neighbouring properties, or on the surface water resources in the area.

The risks posed by contaminated surface water run-off are potentially high, given the vulnerability of the surrounding cutaway peatland area, which is likely to provide baseflow to the neighbouring watercourses, and itself comprises a wetland area;

7.3 Mitigation Measures

Variable concentrations of contaminants were detected during the site investigation. As a consequence, and having regard to the fact that the current site activities are controlled by an Integrated Pollution Prevention and Control licence, the Environmental Protection Agency has been informed of same. Any further investigations, monitoring or intrusive works to be carried out will be in accordance with an agreed strategy with the Environmental Protection Agency, paying due regard to the associated environmental and health and safety risks and implementing the necessary controls. Aquifer protection measures will be employed during the piling in accordance with the current best practice: *Piling and Penetrative Ground Improvement in Land Affected by Contamination: Guidance on Pollution Prevention (Environment Agency, 2001).*

Comprehensive radon monitoring will be conducted on site during the construction phase in accordance with Radiological Protection Institute of Ireland guidelines. Mitigation measures will be agreed with the Radiological Protection Institute of Ireland, based on the monitoring results obtained, in order to prevent build-up of radon gas in enclosed areas

The environmental effects likely to arise during the construction phase of the project will be identified and managed through a Construction Environmental Management Plan (CEMP). The CEMP shall, at a minimum, address the issues relating to effects arising from contaminated ground, as well as other more general environmental impacts as detailed below:

- Water pollution will be prevented through the effective management and storage of chemicals and hydrocarbons.

- A comprehensive and integrated approach for water quality protection during construction will be implemented, to prevent impacts to water quality in watercourses. This will incorporate such principles as silt control measures, such as sedimentation ponds, stabilisation of exposed soils which pose a risk of generation of contaminated surface water run-off and regular inspections and testing, if considered necessary following consultation with the Eastern Regional Fisheries Board;

- Chemicals and hydrocarbons will not be stored within 10 metres of any surface waters or 50 metres of a borehole or well, and the delivery, storage and dispensing locations for these

chemicals and hydrocarbons will be isolated from the surface water drainage system, open ground or other porous surfaces.

- Bunds for the storage of chemicals and hydrocarbons will be lined or constructed of materials resistant to damage by the materials stored therein. In addition, the capacity of such bunds will be a minimum of 110% of the volume of the largest container stored therein, or 25% of the total volume, whichever is the greater. Bunds will be designed in accordance with Environmental Protection Agency guidance in relation to the storage of potentially polluting liquids.

- Portable toilets will be provided on site for the construction phase of the project and arrangements will be made to transport all waste generated to an appropriately licensed off site facility;

- All plant and equipment on site will be regularly maintained and inspected. Leaks will be repaired immediately, prior to use of the affected item. Drip trays will be provided and used for all stationary plant. If wash down is required, a designated wash down area will be used, served by oil / water separators and isolated from the surface water drainage;

- Spill kits will be maintained near working areas. All spills / leaks will be cleaned up immediately and an emergency response plan will be put in place detailing the measures to be undertaken should pollution be identified;

- A Construction and Demolition Waste Management Plan will be developed and implemented. The focus of this plan will be effective identification, quantification and recording of wastes generated on and removed from the construction site. The plan will also demonstrate how compliance is being achieved with all relevant national legislation for waste management, and clearly identify all waste contractors utilised for the disposal, recycling or recovery of waste materials generated on-site;

- Construction activities will be carried out in accordance with international best practice - CIRIA Document C650 *Environmental Good Practice on Site, (CRIA, 2005).*

The major operational phase mitigation measures associated with the proposed development are considered to comprise the following:

- Storage of hydrocarbons and other hazardous or potentially polluting materials will be undertaken in accordance with best practice - see *IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities, EPA, (2004)*, and the conditions detailed for the IPPC licence for the site;

- An emergency response plan, setting out the procedures to be followed in the event of spillages or other pollution events, will be put in place in accordance with the requirements of the Integrated Pollution Prevention Control Licence for the site;

- Waste water, including potentially contaminated runoff, will be treated in dedicated systems to the appropriate standards, prior to discharge off site in accordance with the conditions set out in the Integrated Pollution Prevention Control Licence for the site;

- The proposed maximum abstraction of groundwater, at 630 m^3/day, is likely to cause settlement of the ground within the proposed development site. There is an associated risk of settlement related damage to structures on site. In order to mitigate against this potential risk, all structures on the site will be designed to tolerate such settlement; and

- The maximum abstraction from the pumping well at the proposed development site will be 630 m^3/day.

8 Air Quality and Climate

8.1 Climate:

The methodology for the description of the current climate in the region of the proposed development was a desk study review of published data available for Ireland. An assessment was undertaken to estimate the greenhouse gas emissions arising from the proposed development during the construction and operational phases. These emission levels were then compared to relevant evaluation criteria, such as emission limitations under the Kyoto Protocol, which has set objectives to be achieved over the period 2008 – 2012.

8.1.1 Assessment Conclusions

There is the potential for a number of emissions to atmosphere during the construction phase of the project. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions. With reference to relevant evaluation criteria, such as the Kyoto Protocol, GHG emissions during the construction of the proposed development will be negligible.

The estimated annual CO_2 emissions will be in the range of 543,000 - 814,000 tonnes CO_2 from the proposed power plant. The relative amount of CO_2 emitted per unit of electricity generated from gas fired power plants is significantly lower than that arising from other types of plant. Coal-fired power stations have a CO_2 emission rate which is 2.5 times higher per MWh than a CCGT unit fired on natural gas; peat is three times higher per MWh, whilst Heavy Fuel Oil is twice as high per MWh. Thus, the proposed development is more favourable from a climatic point of view than oil, coal or peat-fired power stations.

8.1.2 Mitigation

This plant will operate under the EU Emissions Trading Scheme, (EU ETS) until at least 2020, and will thus will need to secure a Greenhouse Gas Emissions Permit from the EPA. It is expected that the EU ETS will be extended beyond 2020 under international agreement. No additional mitigation measures are deemed necessary.

8.2 Air Quality:

The methodology for the description of the air quality in the existing environment was based on a desk-based review of relevant literature and a baseline air quality assessment. Following this, modelling exercises were undertaken to describe the likely emissions arising from the proposed power plant, during the construction and operational phases of the proposed development, including those emissions arising from site generated traffic.

8.2.1 Assessment Conclusions

The baseline air quality assessment determined that existing baseline levels of PM_{10}, NO_2, SO_2 and benzene are low and significantly below the ambient air quality standards in the region of Derrygreenagh.

The impact on air quality as a result of traffic accessing the proposed development during the construction and operation of the proposed development is considered to be negligible. The sum of the background concentrations and the additional concentration due to site traffic will lead to levels which are still significantly below relevant air quality limit values.

Air quality impact assessments during the operational phase were assessed, based on a "worst-case" scenario approach. The assessments predicted that emissions are within relevant air quality limit values and overall, short-term and long-term impacts are considered to be neutral, regardless of firing the CCGT and OCGT units on natural gas or distillate.

The power plant development will be designed to the highest standard, with an appropriate exhaust stack height, and also incorporate abatement techniques to ensure minimum emissions from the plant. The power plant will be regulated under the IPPC and Greenhouse Gas Emissions Permit regimes, ensuring emissions from the facility are minimised.

8.2.2 Mitigation

A Dust Minimisation Plan will be implemented during the construction phase of development. Suppression techniques will be implemented to ensure that dust generation is minimised. These measures include water spraying, wheel washing and sheeting of vehicles.

A stack height determination was undertaken to ensure that the appropriate stack height was selected, such that the impact on the surrounding environment would not be significant. The stack height selection process established that a height of 50m for the CCGT unit, and a height of 40m for the OCGT unit, would be appropriate in ensuring that no adverse impact would occur in the surrounding environment in terms of air quality.

9 Noise and Vibration

9.1 Methodology

A baseline noise survey was carried out at the proposed development site, to establish the existing noise environment. This survey serves as a baseline against which the operational noise emissions during daytime and night-time from the proposed plant can be assessed. Four noise sensitive receptors were selected from residences and other buildings, located within approximately 2 km of the proposed site, in order to comprehensively assess the potential noise impacts from the proposed power plant. Construction noise was calculated and assessed with reference to typical construction noise data. The potential noise impact during the operational phase was modelled and assessed.

9.2 Assessment Conclusions

Baseline monitoring was carried out at five locations, both at and surrounding the proposed development site, in order to comprehensively assess the potential noise impacts on noise sensitive receptors arising from the proposed power plant. The baseline noise survey determined that the background noise levels in proximity to the proposed development are considered to be very low, i.e. less than or equal to 30 dB (A) .

Noise levels for 'worst-case' scenarios, during each of three phases of construction, have been predicted at nearest noise sensitive receptors. Normal working hours during the construction period are expected to be Monday to Friday 07:00 – 19:00 and Saturday 08:00 – 16:30. All of this work thus falls into the daytime noise assessment category. Notwithstanding this fact, an assessment of predicted noise levels against evening assessment criteria has also been carried out, as a conservative approach. No night-time work, which would give rise to significant noise, is anticipated during the construction phase of the proposed development. Predicted noise levels indicate that no exceedance of the day-time or evening-time construction noise assessment criteria, $L_{Aeq,T}$ 70 dB and 60 dB respectively, is predicted at any receptor, and consequently no impacts are expected during the construction phase.

Construction phase traffic also has potential to generate noise. An assessment of predicted noise levels arising from traffic during the peak construction phase predicted an increase of 4 dB(A) in the noise level during this period for all vehicles, both HGVs and LCVs. As an introduced noise source, construction traffic using the R400 is likely to be audible above the low background noise levels. However, people will not typically perceive a noise increase below 3 dB (A). As the predicted increase is just 4 dB (A), this increase is not considered to be significant, as it is temporary and will not lead to a noticeably different effect to a change of 3 dB (A).

Predicted noise levels at the closest noise sensitive receptors were assessed under selected operational regimes. The regimes selected include a scenario which represents the typical mode of operation at the site, where the larger CCGT unit only is running, and a "worst case" scenario, where both the OCGT and CCGT units are in operation. No exceedance of the daytime noise assessment criteria is predicted, during either the typical mode of operation or the "worst case" scenario. In the worst-case scenario where the CCGT unit and the OCGT unit were run simultaneously during the night time period, 22:00 to 08:00, it is predicted that the assessment criteria would be exceeded at a single noise sensitive receptor by two dB (A).

However, this is considered to be an infrequent situation and will only occur on a limited number of occasions each year, due to the fact that the OCGT unit will typically only operate for *c.* 500 hours per annum. In addition, the assessment criterion is only exceeded by 2 dB (A), whereas an increase of 3 dB (A) is required for the typical receptor to perceive any difference. For this reason it is not considered that this exceedance results in a significant effect, and it is not necessary to recommend additional mitigation measures. It should also be noted that the level of night time noise experienced by the noise sensitive receptor is significantly less than the $L_{Aeq,T}$ 45dB (A) guidance issued by the EPA. At a noise level of 37 dB(A) outside a bedroom window, which is equivalent to approximately 27 dB(A) inside the bedroom, the noise level at the sensitive receptor is also below the WHO guide level for the onset of sleep disturbance, of 30 dB(A).

Prediction of road noise levels due to operational road traffic has been undertaken. This determined that individual vehicles using the R400 to access the site are likely to be audible above the low background noise levels. Using worst case assumptions, the increased traffic volumes due to the operation of the facility are likely to increase noise levels by less than 1 dB (A) at the nearest noise sensitive receptors during the peak traffic hours. Therefore, no significant impacts are predicted, as a result of operational road traffic, as an increase of 3 dB (A) is typically required before a person would perceive the difference.

9.3 Mitigation

Good practices for construction will be used on site and are predicted to reduce noise levels even further. These practices include ensuring that:

- mobile plant will be managed in an appropriate manner with respect to minimising noise emissions;
- inherently quiet plant will be selected where appropriate;
- noisy plant will be located and orientated as far as possible from sensitive receptors;
- construction contractors will be required to adhere to the relevant codes of practice and legislation.

Predicted noise levels at the noise sensitive receptors during the operation of the CCGT unit alone are below the assessment criteria. Even during the occasional circumstance when both units operate at night, the predicted levels are sufficiently close to the stringent assessment criteria that a significant noise impact is not likely. Predicted noise levels are also lower than the WHO guidance for sleep disturbance, and the normal IPPC licence noise levels that are set by the EPA. Therefore no mitigation has been recommended, beyond the normal mitigation that is inherent in the design, such as enclosing major noise sources within buildings. No significant residual impacts are predicted to occur at the noise sensitive receptors as a result of the proposed development.

10 Landscape and Visual

10.1 Methodology

The methodology employed for the preparation of the landscape and visual impacts assessment was based on the Landscape Institute and Institute of Environmental Management and Assessment, *Guidelines for Landscape and Visual Impact Assessment*, Second Edition published 2002.

A comprehensive site analysis was undertaken to determine views in to and out of the development site and associated locations. Based on this assessment a field study was undertaken, and the locations of each component of the proposed development were visited and photographed in order to determine the character of the site and its environs. Photomontage images of the development were prepared from selected viewpoints. Using the results of the site work and visualisations, impacts on landscape character, landscape features and visual amenity were predicted and the level of significance of each impact was assessed.

10.2 Assessment Conclusions

The implementation of the proposed development will introduce changes into the landscape and views. The proposed development is situated on the site of an existing Bord na Móna administrative, stores and workshop centre for peat harvesting operations. Situated off the R400, approximately 4 km south east of Rochfortbridge, the site is a mineral island surrounded by cutaway peatlands.

The tallest plant component is the exhaust stack from the Heat Recovery Steam Generator (HRSG), which will measure a maximum of 50 m from ground level and 6.9 m in diameter. Other tall structures include the HRSG building, 40 m from ground level and 36 m by 30 m in length and width, the turbine building, 30 m from ground level and 81 m by 48 m in length and width, the Air Cooled Condenser (ACC), 35 m from ground level and 60 m by 46 m in length and width, and the OCGT stack, 40 m from ground level. The cooling system of the proposed power plant will use the technique of air fan cooling, which will result in no water vapour plume emissions. When the power plant is fired on natural gas there will also be no visible emissions, except where the air temperature is very low and water vapour condenses above the exhaust stack. However, when either unit is fired on distillate oil, there will be a more visible vapour plume.

Impacts on landscape elements, landscape character and visual amenity during the construction phase are likely to be sourced from a range of construction activities, including plant and machinery, cranes, site compounds, earthworks and temporary lighting. However these impacts will be short-term and restricted to the construction period.

The proposed development will result in the loss of small areas of trees, hedgerow, shrubs and scrub within the site boundary. The sensitivity of the vegetation to be removed is low, as there is abundant such vegetation elsewhere in the study area. The extent of change is small, therefore the magnitude of landscape impact is not significant.

The indirect effect on the character of the wider landscape was assessed in the context of nearby landscape character areas (LCAs). In the Co. Offaly Landscape, the only direct landscape impact will be on the 'Peatlands' landscape character area. The small amount of peatland area within the site is directly impacted by the proposed development. The magnitude of this change is large, due to the size and bulk of the proposed development. The peatlands are considered as having a medium sensitivity to change, and therefore it is judged that the significance of the landscape impact is moderate to major. In terms of the remaining landscapes within Co. Offaly, the magnitude of change on Eskers, Waterways, Lakes and Forests is considered imperceptible.

Outside of Co. Offaly, the proposed power plant development is expected to be visible particularly from elevated locations, of which there are very few, and most are at considerable distance from the site. The significance of landscape impact on these areas varies from not significant to moderate. Impacts on local designated sites and amenity features are considered to be imperceptible to small.

The introduction of new structures and activity on the site will have adverse impacts upon the quality of views experienced by people living in, working in or visiting the local area. Thirteen viewpoints were selected to represent the range of locations from where people may see the development - refer to Figure 10.1 *Viewpoint Locations*. Of the thirteen viewpoints, the visual impact on 5 viewpoints was considered as "Not Significant" (Viewpoints 2, 8, 9, 10 and 12). The significance of visual impact on 2 viewpoints was considered "Minor" (Viewpoints 1 and 13). Viewpoints 3 and 4 had a "minor to moderate" visual impact, and Viewpoints 5 and 7 had a "moderate to major" impact. Viewpoints 6 and 11 were classified as having a "minor to major" impact.

10.3 Mitigation

A detailed Construction Environmental Management Plan (CEMP) will be developed to include arrangements for the design and implementation of various aspects of the construction works including soil removal, storage and replacement, woodland planting, and measures to protect landscape resources. Measures that will be taken to mitigate landscape and visual impacts during construction will include:

- Design to minimise tree and other vegetation removal;
- Protection of features, such as, woodland and scrub, and other habitats to be retained using fencing;
- Restricting construction lighting outside normal working hours to the minimum required for public safety and security;
- Maintenance of tidy and contained site compounds;
- The development of a dust minimisation plan which will restrict the evacuation of construction dust into the atmosphere by means of regular applications of water to the site where required;
- The spreading of topsoil and replacement of turf, or reseeding and planting as soon as possible after sections of work are complete; and
- Protection of these newly restored areas during re-growth.

Key operational phase mitigation measures integrated into the final layout include:

- A woodland tree belt surrounding the site varying in width from 7.5m to 30m will be established A horticulturist will be employed in order to oversee the proposed planting regime and will be responsible for the development of a full and detailed planting plan;
- The materials, finishes and colours for the proposed structures will be selected to favour the reduction of potential visual impact. Although the top of the stack will have warning lights it will not carry any brightly coloured markings;
- The minimum amount of signage will be used for operational purposes and visual clutter should be avoided, particularly at the entrance to the development. In addition, there will be minimal external lighting as required for health and safety and operational purposes at the site. This lighting will be directional and designed to minimise light pollution;
- A post construction restoration plan will be prepared to guide the appropriate restoration of landscape earthworks, soils and vegetation, as part of the Construction Environmental Management Plan, once the construction phase is complete; and
- It is recommended that a long term management plan be developed to address management of the landscape and ecological resources during the years of operation of the power plant. This will include measures to maintain and enhance the landscape, visual amenity and biodiversity of the area, through habitat and land management.

11 Roads and Traffic

11.1 Methodology

In order to assess the traffic impact arising from the proposed development on the local road network, during both the construction phase and the operational phase, a number of assessments were undertaken as follows:

- ***Traffic Impact Assessment (TIA):*** This traffic impact assessment was carried out to assess the existing traffic and transport conditions in the area, and to assess the impact that traffic generated by the proposed development would likely have on the road network local to the proposed development.
- ***Road Safety Audit:*** A road safety audit was undertaken to identify potential road safety problems, arising due to the proposed development, on the existing road network and on the proposed internal road network within the site.

- ***Road Pavement Analysis:*** In order to assess the existing structural condition and the residual life of the section of the R400 roadway, a road pavement analysis was undertaken.

11.2 Assessment Conclusions

The traffic impact assessment identified the existing, 2008, (base year) traffic conditions at four critical junctions in the vicinity of the proposed development site at Derrygreenagh Co. Offaly. The impact of the proposed development has been assessed using three scenarios, namely the peak construction year 2011, the expected year of opening 2014, and fifteen years from the year of opening, 2029. The analyses undertaken indicate that, even with the addition of the development generated traffic, the local road network operates well within its optimum design capacity. The site will be accessed from the R400 by means of a simple priority junction, although temporary road widening and ghost islands will be implemented during the construction phase of the development. It is not considered that the impact of the proposed development, throughout both the construction and operational phases, will extensively inhibit either through traffic or local traffic, from a capacity point of view.

The road safety audit has informed the modification of the internal layout of the proposed development site. Modifications occurred in relation to road markings, signage, street lighting, car parking and site drainage. In addition, the road safety audit made a number of recommendations in relation to the external road network, i.e. the R400. In particular, a number of issues were highlighted regarding the suitability of the R400 between the site and Rhode village to accommodate significant extra levels of HGV traffic associated with the construction of the plant. On foot of the recommendations of this report, and following consultation with Offaly County Council, it was agreed that a restriction will be imposed on HGV traffic accessing the site during the construction phase, requiring this traffic to approach the site from the north, i.e. from the direction of the junction with the M6 motorway. The implementation of other recommendations from the road safety audit, in regard to the external road network, will be determined with the relevant local authorities in advance of the commencement of the proposed development.

The results of the road pavement analysis indicated that, to achieve a residual life of twenty years on the section of the R400 on which the proposed development will generate traffic, strengthening works will be required on the R400. These works will be required from the entrance to the development site northwards to the newly constructed interchange with the M6. Implementation of such strengthening works would result in a twenty year residual pavement life for all traffic using this section of the R400. The proposed development would constitute 40% of HGV movements on this section of the R400 during its construction phase, and less than 2% of HGV traffic during its operational phase. The implementation of the road strengthening works, identified in the Road Pavement Analysis will be determined with the relevant local authorities in advance of the commencement of the proposed development.

12 Cultural Heritage

12.1 Methodology

A detailed desk top study of available information and data was undertaken in order to set the proposed development within its wider archaeological, architectural and cultural heritage landscape, and to assess the potential of the site. A detailed field inspection was carried out of the proposed development site. The field inspection survey sought to verify the location and extent of known features and to record the location and extent of any new features.

12.2 Assessment Conclusions

The cultural heritage assessment determined that there are no recorded archaeological sites (RMPs) within the study area or within a one kilometre radius of same. The proposed development will have no direct or indirect impact on the architectural heritage.

The site is, however, located within an area of moderate to high archaeological potential. The Irish Archaeological Wetland Unit (IAWU) Survey of Derryarkin and Drumman Bogs, in 2002, identified a significant number of prehistoric archaeological sites and artefacts from the bogs surrounding Derrygreenagh Hill. Twenty-seven sites, two of which were dated to the Bronze Age, were recorded 300-600 m south of the proposed development site. There is moderate to high potential that archaeological subsurface remains may be located *in situ* within the proposed development site.

The archaeological remains that might typically be discovered within the peat on the eastern and northern sides of the site, and at the interface between the wetland and dry land in this area, are toghers (wooden trackways). There is also the potential to uncover archaeological features on the dry land immediately north, east, southeast and south of the workshops at the rear of the Works. The northern, eastern and southern edges of the site appear to be entirely or relatively undisturbed and therefore also have potential for archaeological remains. It is impossible to establish to what level the areas with gravel and hardcore surfaces were disturbed in the past, but the fact that the construction of the Derrygreenagh Works disturbed ground in the past does not remove the possibility that archaeology, if present, may survive as subsurface features.

The route for the proposed discharge pipeline will need to traverse the bog surrounding the site to connect with the Yellow River. The groundworks associated with the proposed pipeline could potentially uncover archaeological remains, given that there are a number of sites recorded in the bog surrounding Derrygreenagh Hill. It will also connect with a river or stream, which are also considered areas of archaeological potential.

12.3 Mitigation

All necessary licences, as specified by the *National Monuments Acts 1930-2004,* will be complied with, should they be required. All archaeological finds and features revealed will be recorded appropriately prior to construction of the proposed scheme, in agreement with the National Monuments Service of the Department of the Environment, Heritage and Local Government and under the direction of the Minister.

Targeted test excavation will take place along the footprints of buildings associated with the proposed development where these locations are on dry land. This will include for example, the turbine hall, water treatment plant and fuel storage area. Targeted testing then allows an assessment to be made on the extent of any surviving archaeology before any further mitigation is decided upon. Should any archaeological material be uncovered, excavation would then be required, subject to the approval by the National Monuments Service of Department of Environment, Heritage and Local Government.

Archaeological monitoring involves a watching brief during the construction stage, where ground levels are reduced by mechanical excavators. There are a number of areas within the proposed development where the underlying ground is bog. This ground is not suitable for archaeological testing and will therefore require archaeological monitoring. The areas which require monitoring will include those designated for: the air cooled condenser, the Contractor's compound, the AGI, the process water and storm water tanks and the process water pipeline.

As testing is limited to exposing small areas of the development, it is recommended that archaeological monitoring of all additional groundworks associated with the development, including the construction of access or haul roads and compounds, be carried out in advance of and during construction works.

13 Interactions of the Foregoing

While all environmental factors are inter-related to some extent, the significant interactions and interdependencies were taken into consideration by the specialist environmental consultants when drafting their technical reports. Consequently, these interactions were integrated into the individual sections of the main EIS.

In addition, to ensure a complete assessment of the environmental impact arising from the scheme, all specialists involved with the preparation of the statement reviewed the relevant section(s) of the statement and contributed as considered appropriate.