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Proposed 450 MW Power Plant at Toomes, Co. Louth

Environmental Impact Statement

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Environmental Impact Statement

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List of Contents

Page

Chapters and Appendices

Appendices

LIST OF FIGURES

LIST OF PLATES

LIST OF TABLES

GLOSSARY

The following provides a partial glossary of terms used in this statement. The definitions therein are not to be taken as comprehensive but solely as an aid to the non-technical reader.

TYPES OF IMPACT:

Positive Impact

A change which improves the quality of the environment.

Neutral Impact

A change which does not affect the quality of the environment.

Negative Impact

A change which reduces the quality of the environment, (for example, by lessening species diversity and the reproductive capacity of the ecosystem, by damaging health, property or by causing nuisance).

Imperceptible Impact

An impact capable of measurement but without noticeable consequences.

Slight Impact

An impact which causes changes in the character of the environment which are not significant or profound.

Significant Impact

An impact which, by its magnitude, duration or intensity alters an important aspect of the environment.

Profound Impact

An impact which obliterates all previous characteristics.

Temporary Impact

Impact lasting for one year or less.

Short-term Impact

Impact lasting one to seven years.

Medium-term Impact

Impact lasting seven to fifteen years.

Long-term Impact

Impact lasting fifteen to sixty years.

Permanent Impact

Impact lasting over sixty years.

Residual Impact

The degree of environmental change that will occur after the proposed mitigation measures have taken place.

OTHER:

Fauna

Fauna is a collective term for animal life of any particular region.

Flora

Plant life occurring in an area.

Groundwater

Water located beneath the ground surface.

Interconnector

The tie line, facilities and equipment that connect the electricity transmission system of one independently supplied transmission network to that of another.

Limit value

Highest acceptable concentrations of a substance.

Methodology

An organised, documented set of procedures.

Mitigation Measures

To mitigate means to ease or soothe the effect of. Mitigation measures suggest ways to avoid or lessen the negative effects of a project on the environment.

Residual Impact

The remaining impact on implementation of the recommended mitigation measures.

Road Capacity

The ability of a road to accommodate traffic. It is expressed in passenger car units per hour.

Road Network

Description (often in diagrammatic form) of a system of roadways.

Radon

Radon gas is a naturally occurring radioactive gas, originating from the decay of uranium on rocks and soils.

Total Transfer Capability

The total capacity available on cross-border circuits between the Republic of Ireland and Northern Ireland.

Transformer

An item of equipment connecting connection points at different nominal voltages.

Abbreviations:

ACC	Air Cooled Condenser
AGI	Above Ground Installation
Barg	Bar Gauge
Bq	Bequerels
BOD	Biological Oxygen Demand
BGN	Bord Gáis Network
CCGT	Combined Cycle Gas Turbine
CER	Commission for Energy Regulation
COD	Chemical Oxygen Demand
DWF	Dry Weather Flow

EPA	Environment Protection Agency
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ESB	Electricity Supply Board
EC	European Community
EU	European Union
GHG	Greenhouse Gases
Ha	Hectares (10 000 square metres)
HGV	Heavy Goods Vehicle
HRSG	Heat Recovery Steam Generator
mbg	Metres below ground
MW	Mega Watts
MWe	Mega Watts Electrical
NPWS	National Parks and Wildlife Service
pNHA	Proposed Natural Heritage Areas
Fill	Material used for raising the level of the ground
NTS	Non-Technical Summary
OD	Ordnance Datum
OPW	Office of Public Works
OS	Ordnance Survey.
SAC (p)(c)	Special Area of Conservation (proposed), (candidate).

NON-TECHNICAL SUMMARY

Introduction

Quinn Group Limited proposes to construct a 450 MW Combined Cycle Gas Turbine (CCGT) power plant at Toomes, Co. Louth on the outskirts of Ballakelly.

The site for the proposed power plant is in a strategic location in close proximity to a 220 kV electrical grid connection (at Monavallet, Co. Louth) and the North-South interconnector gas pipeline. The power plant will run on natural gas, fed by the Bord Gáis Network (BGN). In accordance with regulatory requirements the plant will be designed to utilise low sulphur, (0.1%) diesel as a backup fuel.

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 and predict potential beneficial and / or significant effects providing 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.

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.

Consultation

Submissions regarding the development and the scope of the EIS were invited from a number of statutory bodies and other organisations as follows:

- Department of Environment, Heritage and Local Government, (including National Parks and Wildlife);
- Department of Communications, Energy & Natural Resources;
- Monaghan County Council;
- Louth County Council;
- Environmental Protection Agency;
- Bord Gáis;
- Eastern Regional Fisheries Board;
- Health & Safety Authority;
- Department of Agriculture, Food and Rural Development;
- Office of Public Works;

- Vincent Wildlife Trust;
- Forest Service;
- The National Roads Authority;
- Irish Aviation Authority; and
- Commission for Energy Regulation.

Consultations were also held with Louth County Council, Monaghan County Council, Environmental Protection Agency and Eastern Regional Fisheries Board.

In addition, a public consultation was held on Thursday 19th July 2007 at the Nuremore Hotel, Carrickmacross. Detailed drawings and a presentation were on display with members of Quinn Group and Mott MacDonald Pettit project management teams on hand to answer queries. Approximately 100 members of the public attended the event

Need for the Facility

Ireland has one of the highest costs of industrial electricity in the EU and has seen one of the highest increases in the price of industrial electricity in the EU over the last six years, (53%). Power plants in Ireland tend to be of an older generation which contributes to inefficiencies and low availability.

The need for additional electricity generating capacity and improved availability of existing power generating plants has been highlighted in the Energy White Paper *"Delivering a Sustainable Energy Future for Ireland – The Energy Policy Framework 2007 – 2020."* The *"National Spatial Strategy for Ireland 2002-2020: People, Places and Potential"* also highlighted the need for improved capacity and prioritised the need for strengthening of electricity supply networks.

Between 1990 and 2005 Ireland's energy requirement grew by 64% (mean growth 3.4 % per annum). In 2005 energy requirements grew by 3%. Figures released by EirGrid for 2006 show a further increase of 4.48% over 2005 levels. It is expected that growth levels will remain at approximately 3.8% over the next 6 years. Total energy import dependency reached 90% in 2005, increasing from 69% in 1990.

In addition, the ESB intends to withdraw 1 295 MW (20%) of capacity in the next five years reducing capacity from 6 437 MW to 5 151 MW by the end of 2010. This will increase demands on existing generating capacity and increase the need for power generation plants such as the proposal in Toomes.

Alternatives Technologies Considered

A number of electricity generating options are available including conventional power plants (fuelled by fuel oil, fuel gas or coal), combined heat and power, open cycle gas turbine, wind turbine and diesel power plants. Following an assessment of the options available it was determined that a 450 MW CCGT power plant would provide the optimum choice for this particular installation.

The principal advantages of the CCGT over the alternatives include: security of supply, availability of fuel, lower environmental impact, lower investment costs, higher generation efficiencies, shorter construction periods, high plant reliability and ease of operation.

Alternative Sites Considered

A CCGT power plant requires connection to an available grid connection and a suitable fuel supply. Quinn Group initially investigated the possibilities of acquiring exisiting generation sites including some ESB sites however the timeliness regarding decommissioning of these generation sites was not compatible with the strategic timeliness of Quinn Group. A further assessment of the transmission network, available gas supplies and competing projects identified two suitable regional locations for a CCGT power plant of the size required in Louth and Galway, (a separate development is currently being pursued by Quinn Group in Galway).

The Monavallet 220 kV substation in Louth is a suitable connection point to the transmission network and additionally is in proximity to the gas network, (located approximately 8 kilometres from the substation). Once the Monavallet substation was identified Quinn Group investigated sites in proximity to the 220 kV high voltage transmission lines running from Monavallet.

An existing site in Platin, Co. Meath, for which planning permission for a similar CCGT power plant was granted a number of years ago, was investigated. However, the owner of this land informed Quinn Group that the site was not for sale. It was then decided to find a site as close as possible to the substation in order to minimise the impacts of overhead transmission lines and avail of the opportunity to use a buried cable connection to the substation. A number of potential sites in close proximity to the substation were investigated. Based on an assessment of natural screening potential, existing overhead lines, accessibility, proximity to housing and potential for use of underground cables it was determined that Toomes provided the optimum location in the area.

The proposed site in Toomes is sited in a hollow surrounded by hills offering significant screening potential. In addition the proposed site is located in close proximity to the substation offering easy access to the substation for an underground cable across undeveloped lands thereby avoiding water courses and roads.

Site Description

The existing greenfield site is located in a predominantly rural-agricultural area in the townland of Toomes, Co. Louth to the south southwest of Ballakelly Crossroads, approximately 2.5 kilometres north west of Louth Village. The development site occupies 27.9 acres (11.3 hectares). An additional 8.1 acres (3.3 hectares), comprising a corridor around the west and southern boundary and an area of wetland to the east of the site, will remain undeveloped as an ecological mitigation measure.

Toomes has a low density of residential housing mainly comprising scattered farmhouses and discrete dwellings. The closest dwelling is located approximately 200 metres from the southern side of the outer boundary, (approximately 220 metres from the inner development site boundary). The area immediately surrounding the proposed site is pasture land mainly used by local dairy farmers. There are also a small number of businesses in the area including a haulage company, grocery store and a petrol station. A local road, the LP1143, (Stonetown Road) is located approximately 0.75 kilometres to the north of the site.

There are no water courses in the immediate vicinity of the site. The only significant water courses within a 5 kilometre radius are the River Fane (which flows in a south east direction, approximately 3 kilometres to the northeast of the development site) and the Glyde River, (which flows in a south east direction approximately 2.25 kilometres to the south). A field drain runs along the southern boundary of the site which feeds into a tributary of the River Fane.

The topography of the development site is of lower elevation than the surrounding lands, average 37 metres (Ordnance Datum Malin Head) rising to a peak of 43 metres. The surrounding lands rise from approximately 41 metres to high points of approximately 50 metres in the immediate vicinity. It is proposed that the development area will be at an elevation of 37 metres.

The Monavallet 220 kV sub-station, (to which the electricity generated by the plant will be exported) is located approximately 800 metres to the northeast of the development site. An underground cable will connect the power plant to the substation. The gas connection to the site will be via the Bord Gáis Networks (BGN) grid, the route will be determined by BGN. Refer to Figures *NTS 1 Site Location* and *NTS 2 Site Context*.

Scheme Description

The development comprises a Gas Turbine Generator (GTG), Heat Recovery Steam Generator (HRSG) with a 60 metre exhaust stack, Steam Turbine Generator (STG) and an Air Cooled Condenser (ACC). Ancillary services will include a 220 kV electrical switchyard, an above ground natural gas installation, water storage tanks, water treatment plant, process water discharge pit, stormwater attenuation tank, diesel storage tank, bulk chemical storage, proprietary foul water treatment system, control and administration buildings, car park and access roads. Refer to *NTS 3 Site Layout*.

The proposed facility will also require the following associated developments:

- Connection by an underground pipeline to the BGN.
- Connection by an underground cable to the transmission grid connection point at Monavallet substation.
- Construction of an underground pipeline connection to a discharge point on the River Glyde for discharge of waste water.
- Connection to the Killany-Reaghstown Group Water Scheme at Ballakelly Crossroads.

Pending planning approval the construction phase is expected to commence in early 2008 and last for approximately 30 months. It is anticipated that up to 500 people will be employed with an estimated peak of 14 HGV's per day entering the site. Temporary facilities will be provided during the construction phase including portacabins, welfare facilities, car parking and laydown areas.

Normal working hours during the construction period are expected to be Monday to Friday 08.00 to 20.00 and Saturday 08.00 to 17.00. 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.

A Construction Environmental Management Plan, (CEMP) will be developed and implemented during the construction phase. The CEMP will incorporate the mitigation measures outlined in the EIS providing a framework for the management and implementation of construction activities. The CEMP will be reviewed regularly and revised as necessary to ensure that the measures implemented are effective.

Once the facility is operational it is anticipated that approximately 36 day and shift workers will be employed on site comprising management, operators, technicians and administrative personnel.

The proposed development is scheduled to be fully operational by 2010.

Combined Cycle Gas Turbine Technology

In a CCGT plant, 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 steam turbine; this last step enhances the efficiency of the process. An Open Cycle Gas Turbine (OCGT) is one which does not utilise the waste heat recovery step. At least 50% additional electrical generation is achieved by recovering the heat from the exhaust gases of the Gas Turbine.

Fuel, (natural gas or diesel) is combusted in the gas turbine and the expanding combustion gases drive the gas turbine. The gas turbine has a compressor which draws in air through a filter house and compresses it to supply the compressed air necessary for combustion. The excess power is used to drive a generator which produces electricity. The exhaust gases are still at almost 600^{o}C exiting the gas turbine so these exhaust gases are passed through a heat recovery boiler which generates high pressure steam which is passed to a steam turbine. The expanding steam drives the same generator which provides an additional 50% electrical output.

The steam is expanded to vacuum pressure conditions and a temperature of approximately 40 ^{o}C to extract as much power as possible before being condensed back to water in a condenser in order to pump the water back to the HRSG. A CCGT has an efficiency of close to 58% meaning for 100 MW of heat input, 58 MW output as electricity is achieved. This is broken down as approx 38 MW from the gas turbine and a further 20 MW from the steam turbine. The remaining loss of energy is due to condensing the steam back to water.

Planning and Policy Guidance

Following consultation with An Bord Pleanála it has been determined that the proposed development is a strategic infrastructure development thereby requiring a planning application to be made directly to the Board rather than the local authority.

National and local development policies support the appropriate development of power generation infrastructure. The development will contribute to fulfilling the objectives of the National Spatial Strategy and also the objectives of the Louth County Development Plan, strengthening energy networks and providing a new source of employment of a scale suitable for the locality of Louth Village.

Regulatory Controls

The facility will operate under an Integrated Pollution, Prevention and Control (IPPC) licence as regulated by the Environmental Protection Agency (EPA). The licence will set operational, monitoring and reporting conditions. Under the regime the operator is obliged to employ Best Available Technique (BAT) technology and follow BAT guidance documents ensuring emissions from the facility do not impact significantly on the environment. In addition, the facility will be required to operate under the Greenhouse Gas Emissions Permit regime. Under the regime operators are allocated greenhouse gas emission allowances at the beginning of each year.

In order to comply with Commission for Energy Regulation (CER) regulations, it will be necessary to store diesel on site as a backup fuel in the event of interruption to the natural gas supply. Five days running capacity of diesel will be stored on site, (approximately 10 000 m^{3}) in a 110% capacity bund. The diesel oil will be limited to 0.1% sulphur as per regulatory requirements.

Due to the quantity of diesel being stored on site the proposed facility will be designated a Lower-tier Seveso site under the Seveso II Directive. In accordance with the regulations Quinn Group are required to develop comprehensive plans, risk assessments and systems to ensure high levels of protection are implemented to prevent the occurrence of major accidents. These include a Major Accident Prevention Plan (MAPP), a Safety Management System and an Emergency Plan.

Landscape and Visual Impact

The impact of the proposed development on landscape elements, landscape character and visual amenity was assessed. Both impacts during the construction phase and long term impacts during the operational phase were assessed. The assessment of long term impacts took account of mitigation measures relating to the orientation of the site layout which favoured an easterly location for the stack in the interest of the visual amenity of residents of dwellings located to the south and west. The finishes of the proposed structures (in terms of colour and reflectance) are to be chosen to favour reduction of potential visual impact. The location for the proposals, in a localised hollow is expected to result in partial screening for viewers from some of the selected viewpoint locations.

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, site compounds, earthworks and temporary lighting.

Long term direct impacts on the landscape include permanent loss of undeveloped land together with vegetation losses and some sections of stone walling. The indirect effect on the character of the wider landscape was assessed using a computer generated Zone of Visual Influence which covered a 20 kilometre radius from the centre of the site. The indirect adverse impacts on the receiving landscape character were assessed in the context of local landscape character areas (LLCA's). These were assessed as being major for the Louth Lowland Farmland LLCA, minor for the Fane and Glyde Riverine and Wetland LLCA and Not Significant for the Carrickmacross Drumlins and Loughs LLCA. Further afield outside of these LLCAs and at greater distances from the site, the proposals are expected to have an indirect adverse effect because of its visibility from various locations. These impacts are generally assessed as being minor to not significant.

Long term visual impacts were assessed from 61 viewpoint locations representing a range of viewer types including residents of dwellings, recreational users and those engaged in travel. Adverse visual impacts of a major significance are expected to arise in the viewpoints located at least 1 kilometre from the site. In some cases, adverse impacts of a moderate to major significance are expected to arise in the locations where partial screening of the proposals is expected to occur as a result of the local topography or the presence of buildings. The visual impact of the proposals is expected to be not significant at viewpoints located at distances of greater than 7 kilometres from the site.

The proposed stack, being the tallest element is expected to be viewed as a relatively small to inconspicuous element in the skyline

Roads and Traffic

A traffic impact assessment was conducted to determine the impact of construction and operational phase traffic on the local environment. During the construction phase it is anticipated that 4 000 HGV journeys will be made with an estimated four wide and heavy loads comprising 2 turbines, a generator and a transformer, with possible additional abnormal loads comprising heat recovery steam generator modules. During the peak construction period it is anticipated that 14 HGV's will access the site daily, in addition to an estimated 500 construction workers. It is anticipated that private buses will be arranged for the majority of construction workers thereby minimising the impact on local roads during this period. A Traffic Management Plan will be developed and implemented in order to coordinate the likely traffic generated during the construction phase. The plan will include requirements for employee transportation, work start times, delivery times etc.

In order to accommodate construction traffic it is proposed to develop a link road from the LP1143, (Stonetown Road) to the R178. This access road will significantly reduce the impact of the construction phase on local traffic in the area. In addition, the link road will direct traffic away from Stonetown National School, located to the west of the link road on the LP1143. Both Monaghan and Louth County Councils were consulted regarding appropriate routing of the link road.

During the operational phase it is anticipated that 36 staff will be employed on site contributing 76 journeys per day, (based on shift workers and day workers). This volume of traffic is not anticipated to impact significantly on the local road network.

Ballakelly Crossroads is located to the east of the proposed access road. The crossroads link the R178 with the LP1143. Sightlines from the junction are poor and considered unsafe. It is envisaged that the new link road will also be used by local traffic providing a significantly safer option for accessing the R178 benefiting the community as a whole.

Socio-economics

Up to 500 construction workers will be employed on site during the construction phase resulting in a significant short-term positive impact for the local economy providing both direct and secondary employment opportunities. The influx of construction workers to the area will positively impact on local businesses which will provide them with services including accommodation, food and entertainment. The supply of services and supplies to the site will also have a positive impact on the local economy. The proposed development will lead to the creation of 36 permanent jobs comprising management, operators, technicians and administrative personnel.

Water will be provided to the site via the Killany-Reaghstown Group Water Scheme. Gas will be provided from the BGN via a new gas pipline to the area. Connection to the substation will be via an underground cable. Service connections will be carried out at low demand periods in order to minimise disruption to local supplies.

It is considered that the overall impact from a socio-economic perspective will be positive.

Noise and Vibration

Seven noise sensitive receptors were selected within approximately 1 kilometre of the proposed site in order to comprehensively assess the potential noise impacts from the proposed power plant. Day and nightime baseline noise surveys determined that the background noise levels in proximity to the proposed development are considered to be very low, (i.e. less than 30 dB). The noise impacts were thus assessed in accordance with guidelines appropriate to very quiet areas. In accordance with the guidelines an exceedance of background levels of 5 dB is considered to be marginal, while complaints are considered likely where the noise level exceeds the background by 10 dB or more.

With the implementation of noise mitigation measures, (including improvements to the building shell of the main turbine hall and HRSG, enclosure of fuel pumps, addition of an inlet louver system to the Gas Turbine Filter House and modification of fan coolers and air cooled condenser) the resultant noise levels range from 31 dB to 39 dB. These levels predict a small but noticeable change to the noise environment at three of the seven receptors selected. However, the change is considered to be within acceptable levels satisfying the requirements of relevant guidelines for very quiet areas through the implementation of best available techniques.

During the construction phase it is anticipated that there will no exceedence of day time construction noise assessment guidelines. However, if a "worst-case scenario" combination of construction activities occurs on site during the evening period it is anticipated that the evening criteria guidelines may be exceeded. This can be mitigated against by planned construction activities ensuring that the noisiest activities are conducted outside of evening hours.

Construction activities are likely to be audible in the vicinity of the development, as the area has particularly low background noise levels. However, due to the temporary and transient nature of works and the distance to the nearest sensitive receptors the impact is not considered to be significant.

Climate and Air Quality

Due to the scale of the proposed development, no impacts on climate have been identified during either the construction or operational phases.

During the construction phase there is a potential for dust to be generated. As there are no dwellings within the accepted range of dust deposition it is anticipated that dust will not impact on nearby residences. However, dust suppression techniques will be implemented to ensure that dust generation is minimised. These measures include water spraying, wheel washing and sheeting of vehicles.

Air Quality impact assessments during the operational phase were assessed based on a "worst-case" scenario approach in relation to weather conditions, continuous operation, natural gas and diesel firing. 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 on natural gas or diesel.

The power plant will be designed to the highest standard with an optimum exhaust stack height and abatement techniques to ensure minimum emissions from the plant. Moreover as described previously, the power plant will be regulated under the IPPC and Greenhouse Gas Emissions Permit regimes ensuring emissions fom the facility are minimised.

Ecology

Ecological surveys conducted on the proposed site have identified it as being an area of high ecological value of local importance. A mosaic of valuable habitat was identified including wet woodland and wet grassland. Extensive consultations were subsequently conducted with National Parks and Wildlife Service (NPWS), the government department charged with the conservation of habitats and species in Ireland, regarding the implementation of appropriate mitigation measures to minimise the impact of the development on the ecology of the area. It was agreed that a significant portion of the land, equating to 22%, would be retained in its natural state as a mitigatory measure. The land in question stretches from the western boundary around the southern boundary and incorporates an area of wet woodland to the east of the site.

Overall it is considered that the development will have a significant impact on the ecological resources of the proposed site. However, the measures described will mitigate the impact of the development in part providing an opportunity to support biodiversity within the local area. In addition, scrub is actively encroaching on the wet grassland area of the development site. If the site is left in an unmanaged state the scrub habitat may continue to colonise and thus deplete the grassland areas.

Soils, Geology and Hydrgeology

A preliminary ground investigation was carried out at the proposed development site in order to provide baseline information regarding soils, geology and hydrogeology. Supplementary hydrogeological assessments will be carried out prior to construction.

Based on the findings of the ground investigation and a desk-top review it has been determined that the bedrock in the area comprises shale with occasional limestone outcrops. The drift geology comprises glacial deposits of boulder clay with small areas of sands and gravels.

The site is an undeveloped greenfield site, no waste material was encountered during the ground investigation or site walkover.

The site is classified as an extremely vulnerable poor aquifer, (which is generally unproductive except for local zones). There are 11 registered groundwater wells within a two kilometre radius of the site. In all cases the yields are low, indicative of a poor aquifer area. Groundwater quality data in the locality is limited however, it is considered likely that groundwater local to the proposed site is indicative of limestone areas i.e. hard water with a relatively high sulphate content. Available information suggests that groundwater in the immediate vicinity of the site may be limited with occasional perched water in places. It is considered likely that groundwater flow direction is to the east or south east of the site in line with the topography of the area.

The area around Toomes is classified as a high radon area i.e. more than 10% of houses in the area are predicted to have radon levels in excess of 200 Bq/m³. In open spaces radon dissipates quickly however in enclosed areas, such as buildings, radon can accumulate to dangerous levels. Comprehensive radon monitoring will be conducted on site during the construction phase in accordance with relevant guidelines. It is anticipated that a radon gas barrier will be required on site. Additional mitigation measures will be implemented, as necessary, in consultation with the Radiological Protection Institute of Ireland.

Construction activities will include the stripping and re-grading of topsoil as well as excavations for underground works including foundations and installation of underground storage tanks. Sediment traps will be installed on site during the construction phase. The water will be directed to a discharge point in the Glyde River thereby preventing sediment run-off from entering the field drain located to the south of the site. On site refuelling of mobile plant and machinery will be carried out in designated contained areas. Potentially polluting substances will be contained in suitable containers within bunds in designated areas. The implementation of good construction management practices will minimise the risk of pollution to soils and groundwater during the construction phase.

Portable chemical toilets will be installed on site during the construction phase with all waste sent off site for appropriate disposal at a licensed facility. It is proposed that a proprietary secondary treatment system will be installed on site during the operational phase for the treatment of waste water, (other than process waste water and rain water). The treated water will either be discharged to the Glyde River or percolated to ground, based on the findings of additional assessments including percolation testing. The treated water will comply with all the appropriate guidelines and, if it is discharged to ground, is not anticipated to impact negatively on groundwater in the area.

Plant design including hardstanding areas, bunding, dedicated drainage channels and storage tanks will mitigate against any potential impacts to soils, geology and hydrogeology during the operational phase.

Archaeology, Architecture and Cultural Heritage

A desk and field based assessment of archaeological, architectural and cultural heritage was conducted on the development site and surrounding area. It was determined that there are no recorded archaeological monuments or sites of architectural heritage value within the site of the proposed development. No upstanding archaeological sites or features were noted within the site during the field assessment. However, there is the potential for previously unrecorded archaeological remains to survive on the site.

It is proposed that an additional archaeological assessment will be carried out on site prior to commencement of construction activities. In addition it is proposed that a wade survey or dive survey will be conducted at the proposed waste water discharge point on the Glyde River. Should any archaeological features or material be uncovered works will cease immediately, and the National Monuments Section of the Department of Environment, Heritage and Local Government will be informed.

Water

A supply of feedwater is required to generate steam in the HRSG. In order to avoid corrosion over the lifetime of the plant, the feed-water must be treated prior to use in a demineralisation treatment plant. The proposed plant will include two demineralised water storage tanks with a combined capacity of 10 000 m^3. Feed water will be sourced from the Killany - Reaghstown Group Water Scheme (GWS) which has a water abstraction facility at Monalty Lough.

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).

The process waste water to be discharged from the site comprises water from the demineralisation plant and boiler blow-down comprising of water which has been circulating in the water / steam cycle.

The process waste water to be discharged contains levels of salts that are considered too high for the HRSG however, the levels are generally lower than that of the original "raw" feedwater. The process waste water will be recycled through the demineralisation plant where possible however it will be necessary to discharge a certain volume. Process waste water destined for discharge will gravitate to a process discharge pit where it will be cooled, pH tested and pH corrected with an acid / base dosing system, if necessary. Dissolved oxygen, pH, conductivity and temperature will be continuously monitored. The automated system will only release the waste water if these parameters are within the limits set in the IPPC licence. If they fall outside of these limits the system will automatically switch back to recirculation mode and the waste process water will be re-circulated back to the aeration chambers. Discharge volumes will be measured via a flowmeter installed on the discharge line. In addition, the process waste water discharge pit will be fitted with an automatic sampler which will sample water discharges over a given period as directed by the EPA under the IPPC regime. An on-site laboratory will also be provided to facilitate monitoring of specific parameters on site.

All surface water run-off collected on site will be fed via gravity fed and pumped channels to a hydrocarbon interceptor and a silt trap. The water will then be fed to an attenuation tank whereby its release to the Glyde River will be controlled in order to ensure that the volumes discharged are within acceptable limits.

Foul waste water will be treated in a proprietary secondary treatment system prior to discharge. The treated water will either be discharged to the Glyde River or percolated to ground, depending on a site suitability assessment, (including percolation testing).

Following consultation with Louth County Council and the Eastern Regional Fisheries Board it has been determined that the Glyde River is the most suitable discharge location for the site. In order to access this discharge point, a pipeline will be required which will allow waste water to be pumped from the proposed development site to the discharge point. The pipeline required will be approximately 6.7 kilometres in length. Following agreement with Louth County Council Roads Department it is proposed that this pipeline will run primarily along the side of roadways over most of its length.

Interaction of the Foregoing

While all environmental factors are inter-related to some extent, the significant interactions and inter-dependencies 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 environmental impact statement. A summary overview of the interactions is provided in *Chapter 14* of the EIS.

1 Introduction

1.1 Introduction

Quinn Group Limited commissioned Mott MacDonald Pettit Limited (MMP) to prepare an Environmental Impact Statement (EIS) and planning application for the proposed construction of a wholly privately owned Combined Cycle Gas Turbine (CCGT) power plant. The proposed development is in the townland of Toomes, Co. Louth on the outskirts of Ballakelly, (OS Grid Reference: 293 300, 302 200). Refer to *Figure 1.1 Site Location.*

The power plant will have a nominal capacity of 450 MW providing approximately 8% of peak demand in Ireland in 2010. The primary fuel source will be natural gas, with diesel as a backup fuel.

The site of the proposed development occupies an area of 27.9 acres (11.3 hectares). An additional 8.1 acres (3.3 hectares) of land bordering the development area will remain undeveloped. The development site is an area of marginal agricultural land surrounded by pasture.

1.2 Quinn Group Limited Company Profile

Quinn Group Limited is one of Ireland's most successful companies with a proven track record of success in the diverse industries it has ventured into: cement and concrete products, container glass, general insurance, radiators, plastics, hospitality, health insurance and real estate.

Quinn Group was formed by its chairman Mr. Sean Quinn in 1973, developing from a small quarrying operation in Derrylin, Co. Fermanagh into a large global organisation employing over 6 500 people.

As a large user of electricity within its manufacturing base, the Group recognised the potential of the energy market at an early stage. Quinn Group constructed a five mega-watt wind farm in 1995 on the Slieve Rushen Mountain, which nestles behind the core-manufacturing base of the Group at Derrylin. This was further complemented in 2004 by the addition of a 13.5 MW wind farm at Snugborough, Ballyconnell, Co. Cavan. The combined 18.5 MW output of these windfarms is sufficient to support the electricity requirements of 11 000 homes. An additional 54 MW wind farm (18 x 3 MW wind turbines) is currently under construction at Slieve Rushen. It is anticipated that the additional wind turbines will generate enough electricity to support 32 000 homes.

1.3 Outline of the Project

The proposed development comprises a natural gas fired CCGT power plant with an electrical output capacity of 450 MW. A CCGT power plant works on the principle of optimum electricity generating efficiency. In a CCGT plant, 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 last step enhances the efficiency of the process.

The proposed development site is in a strategic location in close proximity to a 220 kV electrical grid connection and the North-South interconnector gas pipeline. Electrical power will be exported from a 220 kV switchyard to be constructed on site via an underground cable to the existing 220 kV electrical sub-station at Monavallet, Co. Louth identified in *Figure 1.2 Site Context*.

The power plant will supply electricity via the regulated electricity market. Natural gas, supplied from the Bord Gáis Network (BGN) grid, will be the primary fuel source for the facility. To comply with Commission for Energy Regulation (CER) regulations, diesel will be used as a backup fuel in the event of interruption to the natural gas supply. Five days running capacity of diesel will be stored on site, (approximately 10 000m^3) within a 110% capacity bund. The diesel oil will be limited to 0.1% sulphur in fuel as per the requirements of *EU Directive 1999/32/EC, (relating to a reduction in the sulphur content of certain liquid fuels).*

The development will include a primary power generation plant comprising:

- Gas Turbine Generator (GTG).
- Heat Recovery Steam Generator (HRSG) with exhaust stack.
- Steam Turbine Generator (STG).
- Air Cooled Condenser (ACC).

Ancillary services will include a fire pump house, water treatment plant, process water discharge pit, stormwater attenuation tank, diesel storage tank, bulk chemical storage tanks (Sulphuric Acid and Sodium Hydroxide), water storage tanks, an above ground natural gas installation (comprising gas compressor, gas metering, pressure reducing, heating and filtering skids), a 220 kV electrical switchyard (with control building, electrical equipment and masts), minor ancillary buildings and a proprietary foul water treatment system. Site buildings and works will include control and administration buildings, workshops, canteen and stores, gatehouse, landscaping, fencing, car parks and access roads.

In addition, the proposed facility will require the following associated developments:

- Construction of an underground pipeline connection by BGN, from the existing North-South interconnector gas supply line to the above ground installation (AGI) to be constructed on the site, (the routing of which will be subject to standard route optimisation). BGN will be responsible for the construction of the pipeline, and the associated routing.
- Construction of an electricity switchyard within the site, which will be connected by an underground cable, provided by EirGrid, to the transmission grid connection point indicated by EirGrid.
- Construction of a maximum eight inch underground pipeline connection to a discharge point on the River Glyde for discharge of waste water.
- Construction of a maximum four inch water supply pipeline to the Killany-Reaghstown Group Water Scheme.
- Construction of site access and link roads.

Pending planning approval the construction phase is expected to commence in early 2008. The proposed development is scheduled to be fully operational by 2010.

A detailed description of the site, neighbouring land uses and the proposed development is provided in *Chapter 3 Description of the Development*.

1.4 EIS Methodology and Format

The primary objective of the Environmental Impact Statement (EIS) is to identify baseline environmental and socio-economic conditions in the area of the proposed development and predict potential beneficial and / or significant effects providing mitigation measures where considered necessary.

1.4.1 Statutory Requirements

An EIS is required for classes of development prescribed by Article 93 and Schedule 5 of the *Planning and Development Regulations 2001-2006* and Article 23 of the *European Communities (Environmental Impact Assessment Regulations) 1989-2006*. An EIS, (as defined by the Regulations) is:

"*A statement of the effects, if any, which a proposed development if carried out, would have on the environment."*

The European Communities (Environmental Impact Assessment) Regulations, 1989-2006 and the Planning and Development Regulations 2001-2006 bring EC Directive 85/337/EEC, as amended by Directives 97/11 and Article 3 of 2003/35/EC, (commonly known as the Environmental Impact Assessment Directive) into effect.

Following consultation with An Bord Pleanála it has been determined that the proposed development satisfies the conditions set out in Sections 37A (1) and 37A (2) for a Seventh Schedule development as described in the Planning and Development (Strategic Infrastructure) Act 2006:

> *"a thermal power station or other combustion installation with a total energy output of 300 megawatts or more."*

The planning framework for the proposed development is discussed in greater detail in *Chapter 4 Planning and Policy Context.*

A copy of the letter from An Bord Pleanála indicating that the development comes under the regime of the Strategic Infrastructure Act is included in *Appendix 1.1*.

1.4.2 EIS Methodology

This EIS has been prepared in accordance with all relevant legislation, guidance and advice notes including:

- Guidelines on the Information to be Contained in Environmental Impact Statements, March 2002 (derived from the European Communities (Environmental Impact Assessment) Regulations 1989 to 1999 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.
- Current Local, County, Regional and National Development Plans

Preliminary studies identified the Technical Scope (range of aspects) of the EIS taking both spatial (geographical) and temporal (time) factors into account. Site surveys and modelling exercises were then carried out to identify the predicted impacts arising from the proposed development. Each impact was then evaluated in turn and assessments made regarding the required mitigation measures, if any.

1.4.3 EIS Format

The EPA document "*Guidelines on the Information to be Contained in Environmental Impact Statements (March 2002)"* and the Second Schedule of the European Communities (Environmental Impact Assessment) (Amendment) Regulations, 1999 outline the general format and layout of an EIS.

The information detailed in the statement follows the "Grouped Format Structure" as described in the EPA guidelines (2002).

- Introduction.
- Background to the Project.
- Description of the Proposed Development.
- Receiving Environment, Impacts and Mitigation Measures.
- Interaction of the Foregoing.
- Non-Technical Summary.

The topics covered include:

- Landscape and Visual.
- Roads and Traffic.
- Socio-economics.
- Noise and Vibration.
- Air Quality and Climate.
- Ecology.
- Soils, Geology and Hydrogeology.
- Archaeology, Architecture and Cultural Heritage.
- Water.

1.4.4 EIS Scoping

In order to identify the issues that needed to be addressed in the EIS a scoping exercise was undertaken which included the following:

- Site reconnaissance.
- Written consultation with Statutory Consultees.
- Public consultation.
- Consultation with Louth and Monaghan County Councils.
- Consultation with Eastern Regional Fisheries Board.
- Consultation with the Environmnetal Protection Agency.

- Pre-application consultation with An Bord Pleanála.

1.4.5 Consultation

(i) Statutory Bodies and Other Organisations

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 in *Table 1.1* below.

Table 1.1: Submissions Received

Consultee	Response Received	Main Concerns Raised / Comments	Relevant EIS Chapter
Louth County Council	Yes	Noise Emissions Air Emissions Ecology Water Supply and Discharge	Chapter 8 Noise Chapter 9 Climate and Air Quality Chapter 10 Ecology Chapter 14 Water
Department of Environment, Heritage and Local Government	Yes	Ecology Archaeological and Architectural Heritage (general requirements regarding EIS)	Chapter 10 Ecology Chapter 12 Archaeology, Architecture and Cultural Heritage
Department of Communications, Energy & Natural Resources	Yes	Discharge and supply of water	Chapter 14 Water
Environmental Protection Agency	Yes	EIS methodology and IPPC application timelines.	N/A
Bord Gáis	Yes	None	N/A
Eastern Regional Fisheries Board	Yes	Discharge of process waste water to River Glyde and water abstraction.	Chapter 14 Water
Health & Safety Authority	Yes	Statutory requirements regarding Health and Safety	N/A
Department of Agriculture, Food and Rural Development	Yes	None	N/A
Office of Public Works	Yes	Discharge of process waste water	Chapter 14 Water
Vincent Wildlife Trust	Yes	Potential presence of bats	Chapter 10 Ecology
Forest Service	Yes	Replacement of felled trees, (notification of 19 hectare plantation close to site)	Chapter 5 Landscape and Visual Chapter 9 Climate and Air Quality Chapter 10 Ecology
The National Roads Authority	Yes	Compliance with NRA guidelines and policies	N/A
Irish Aviation Authority	Yes	None	N/A
Commission for Energy Regulation	Yes	None	N/A

The following statutory bodies and organisations were invited to submit comments however written responses were not received; Monaghan County Council, An Taisce, An Garda Siochana, Fáilte Ireland, Teagasc, Central Fisheries Board, Irish Peatland Conservation Council, ESB, Bat Conservation Ireland, The Heritage Council, Border Regional Authority, GSI Ireland, Coillte Teoranta, Birdwatch Ireland and Irish Wildlife Trust.

Meetings were held with the following to discuss specific issues relating to the development.

- Louth County Council Planning Department, (1st May 2007).
    - Louth County Council Planning Department was consulted regarding general provisions for inclusion in the EIS.
- Louth County Council Water Department, (10th May 2007).
    - Mark O'Callaghan of Louth County Council Water Department was consulted regarding suitable supply and discharge of water.
- Louth County Council Roads Department, (6th July 2007 and 13th August 2007)
    - Frank Magee (Divisional Head of Roads) and Paul Gallagher (Area Manager) of Louth County Council Road Departments were consulted on the most appropriate access for the proposed site.
- Monaghan County Council Roads Department, (13th August 2007).
    - Richard Donagh (Roads Engineer) of Monaghan County Council was also consulted as the proposed link road crosses the Louth / Monaghan border.
- National Parks and Wildlife Service, (6th June 2007, 4th and 18th July 2007, 1st and 7th August 2007).
    - Extensive consultations were conducted with National Parks and Wildlife Service (NPWS) regarding ecological issues associated with the development site. An agreement on suitable mitigation was reached on 7th August 2007. A copy of a letter from NPWS supporting the mitigation measures incorporated is provided in *Appendix 1.2.*
- Environmental Protection Agency, (24th August 2007)
    - The EPA was consulted regarding the methodology to be employed in the EIS and IPPC application timelines.
- Eastern Regional Fisheries Board, (31st August 2007)
    - A meeting was held with the Eastern Regional Fisheries Board regarding quality of discharge water and appropriate discharge locations.

Submissions and comments received from statutory bodies and interested parties were considered throughout the design phase of the power plant and preparation of the EIS, written responses are included in *Appendix 1.3*

(ii) Public Consultation

Comments on the proposed development were invited from the public by means of an Open Day held on Thursday 19th July 2007 at the Nuremore Hotel, Carrickmacross.

An invitation to the Open Day was issued to members of the public by means of two newspaper advertisements in the Dundalk Democrat Newspapers (published 18th July 2007) and the Dundalk Life Newspaper (published 13th July 2007) and through a brochure mail drop to all addresses within a five mile radius of the proposed site.

Local representatives (as advertised on Monaghan County Council and Louth County Council websites) were also invited of which the following were in attendance Jim Lennon, (Councillor for Fine Gael) Arthur Morgan, (TD for Sinn Féin) and Thomas Sharkey, (Councillor for Sinn Féin). In addition, the following TDs were invited; Dermot Ahern (Fianna Fáil), Seamus Kirk (Fianna Fáil), Arthur Morgan (Sinn Féin), and Fergus O'Dowd (Fine Gael).

Detailed drawings and a presentation were on display during the Open Day with members of Quinn Group and Mott MacDonald Pettit project management teams on hand to answer queries. Comment forms were provided detailing an e-mail address for specific queries, written responses were also received on the day. Approximately 100 members of the public attended the event, three comment forms were received. A copy of the invitation issued is provided in *Appendix 1.4*.

The responses received were general in nature relating to human and animal health impacts, air emissions, noise, traffic, landscape and potential devaluation of property prices. All three responses stated that the public consultation exercise was beneficial providing information on the proposed development. The relevant Chapters of this EIS address each issue in turn.

1.5 Sub-Consultants Engaged

The following sub-consultants were engaged in the preparation of this EIS:

- ERM (Environmental Resources Management Ireland Ltd)
    - Ecology / Noise and Vibration / Landscape and Visual Impact Assessment.
- CRDS (Cultural Resource Development Services)
    - Archaeology, Architecture and Cultural Heritage.
- MHL & Associates Ltd
    - Roads and Traffic.
- Glover Site Investigations Limited
    - Preliminary Ground Investigation.

1.6 Key Challenges Encountered

During the environmental impact assessment process a number of challenges were encountered regarding ecology, available water supply, road access and suitable water discharge locations.

Ecology

The initial Phase I assessment highlighted potential areas of high ecological value within the development area. Consultation was initiated with the Local Conservation Ranger and the Divisional Ecologist for Co. Louth. As discussed in *Section 1.4.5*, following extensive consultation appropriate mitigation measures were agreed between NPWS and Quinn Group. A copy of a letter from NPWS supporting the mitigation measures is provided in *Appendix 1.2*.

Water Supply

Louth County Council was consulted regarding a water supply for the development. Following confirmation that Louth County Council is not in a position to supply a long-term water supply an alternative, Killanny-Reaghstown Group Water Scheme, was sought and obtained. Water supply is discussed in detail in *Chapter 13 Water.*

Access Road

Initially the option of exiting onto the local Stonetown Road, (LP1143) to the north of the proposed development site was considered. Following consultation with Louth and Monaghan County Councils it was agreed that Ballakelly Crossroads contributed significant challenges regarding access for construction traffic. It was agreed that a new link road onto the R178 would provide the most suitable access to the proposed site. In addition the link road will provide a safer option for local traffic accessing the R178 in the future. *Chapter 6 Roads and Traffic* describes the traffic impacts associated with the development.

Water Discharge

Initially both the River Fane and the Glyde River were considered for discharge of water from the facility. Following assimilative capacity calculations and consultation with Louth County Council it was determined that the Glyde River is the most appropriate river for discharge of water. The Eastern Regional Fisheries Board (ERFB) was consulted regarding preferred discharge points. They advised that the Glyde River fishery habitats are particularly sensitive along certain stretches of the river. A suitable discharge point was agreed in consultation with the ERFB. Water is discussed in detail in *Chapter 13 Water.*

2 Background to the Project

2.1 Need for the Facility

Ireland will face significant challenges delivering a sustainable energy supply in the future. Between 1990 and 2005 Ireland's energy requirement grew by 64% (mean growth 3.4% per annum). In 2005 energy requirements grew by 3%. Figures released by EirGrid for 2006 show a further increase of 4.48% over 2005 levels. It is expected that growth levels will remain at approximately 3.8% over the next 6 years. Total energy import dependency reached 90% in 2005, increasing from 69% in 1990.

The Energy White Paper *"Delivering a Sustainable Energy Future for Ireland (The Energy Policy Framework) 2007 – 2020"* (published by the Department of Communications, Marine and Natural Resources on 12th March 2007), highlighted the need for additional electricity generating capacity and improved availability of existing generating stations.

The need for additional generating capacity was also highlighted in the *National Spatial Strategy Report* which prioritises the need for strengthening of electricity supply networks.

Historically in Ireland electricity supply efficiencies have been poor with an overall efficiency of national electricity generation of 41.6%. Increased efficiencies of electricity supply from 2002 have largely been attributed to the commissioning of new CCGT plants similar to the proposed facility. The proposed power plant will have an efficiency of approximately 58% which significantly exceeds the overall national electricity generating efficiency figure of 41.6%. The continued role for gas in electricity supply was also recognised in the Government White Paper due to the lack of further large scale hydro electric development and the prohibition on nuclear energy.

Ireland's high cost of electricity and low level of spare capacity was highlighted in Forfas's *Electricity Benchmarking Analysis, December 2006*. Ireland has one of the highest costs of industrial electricity in the EU and has seen one of the highest increases in the price of industrial electricity over the last six years, (53%). The Forfás report highlights the low level of spare capacity over peak demand in Ireland which is mainly due to our levels of installed capacity and the poor performance of our generators in comparison with other EU countries. The report also highlights how our generation and supply markets are dominated by one major generator / supplier.

In addition, the ESB intends to withdraw 1 295 MW (20%) of capacity in the next five years reducing capacity from 6 437 MW to 5 151 MW by the end of 2010 as detailed in *Table 2.1*, (the figures provided are sourced from *EirGrid Generation Adequacy Report, 2007 – 2012).*

Table 2.1: Electricity Capacity Forecast

	2006	2007	2008	2009	2010	2010	2011
[1]Total Installed Capacity of Fully Dispatchable Plant	5 836	6 445	6 440	6 440	6 437	6 437	6 437
Capacity Withdrawn	0	230	0	309	405	0	351
Enduring Capacity	5 836	6 215	6 215	5 906	5 501	5 501	5 150

[1]Total Installed Capacity is the total electrical capacity of all types of power plants including thermal, hydro, geothermal, wind and any other types of power plants.

The plant closures were formally announced on June 29th 2007 by the CER with the timelines agreed with the ESB as detailed in *Table 2.2* below.

Table 2.2: Plant Closure Timelines

Power Plant	Location	Nominal Capacity	Main Fuel Type	Expected Date of Closure
Great Island	Wexford	216 MW	Oil	2008 (Great Island 1, 2 and 3)
Poolbeg	Dublin	461 MW	Oil / Gas	2007 (Poolbeg 3) 2009 (Poolbeg 1 and 2)
Tarbert	Kerry	590 MW	Oil	2009 (Tarbert 1 and 2) 2010 (Tarbert 3 and 4)
Marina Steam Turbine	Cork	27 MW	Gas	2009

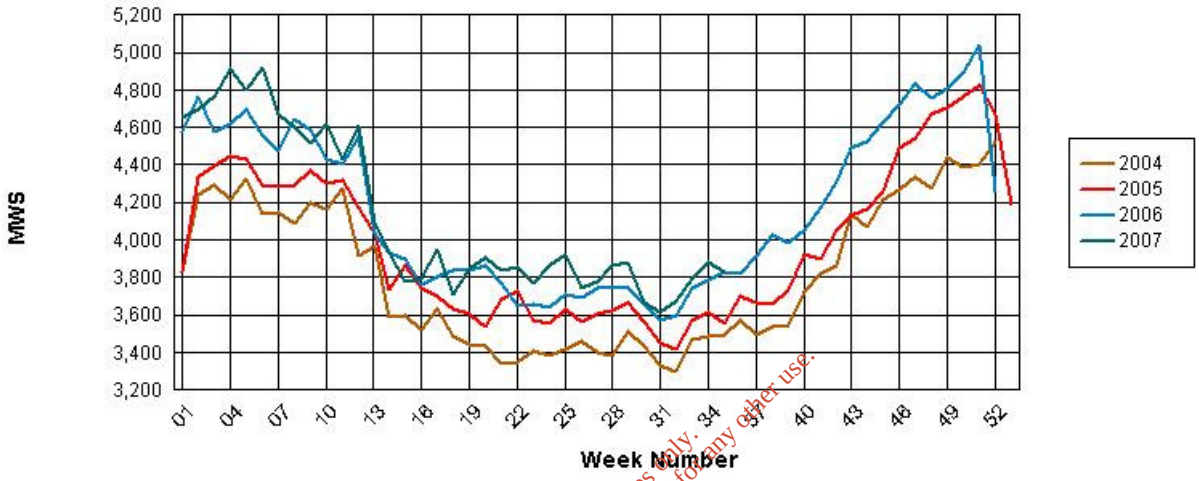
The EirGrid document *Transmission Forecast Statement 2007 – 2013* shows the projected increase in the peak demand of electricity over the next six years as illustrated in *Table 2.3*. The projected peak demand levels have already increased since the previous forecast statement for 2006 - 2012 on which Quinn Groups original plans were based.

Table 2.3: Forecast of Peak Transmission

Demand Year	Peak Demand (MW)
2007	5 008
2008	5 215
2009	5 419
2010	5 647
2011	5 853
2012	6 048
2013	6 230

Electricity demand will have increased by 639 MW between 2007 and 2010. Combined with the retirement of ESB generating assets (1 294 MW) as detailed above, there is an urgent need for new installed generating capacity by 2010. *Figure 2.1* below illustrates the year on year increase in peak demand over the last four years (reproduced courtesy of Eirgrid).

Figure 2.1: Peak Demand Increase



The proposed development of a 450 MW power plant at Toomes will provide approximately 8% of the peak demand need in 2010. It will introduce more competition into the market, improve the level of spare capacity in the grid due to the higher availability of new CCGT's, reduce electricity costs due to the higher generation efficiencies and availabilities and also reduce our carbon emissions per MW due to the higher efficiencies.

2.2 Main Alternative Technologies Considered

In the selection of the optimum plant design, a number of factors affecting its technical and financial viability were taken into account. The principal factors assessed were:

- Proximity to a steady and secure fuel source, (natural gas pipeline).
- Proximity to the EirGrid high voltage distribution network.
- Proximity to a significant electrical load centre.
    - North - South interconnector.
    - Proposed East - West interconnector.
- Unit size required to meet growing electricity demands in Ireland.
- Thermal efficiency.
    - Efficiency of the unit in converting all available energy of the fuel into electrical or thermal energy.
- Proven technology and reliability.
- Load factor.

  - Flexibility of the plant to operate efficiently at different loads.
- Site area constraints.
- Local infrastructure.
- Environmental considerations.

Considering the above-mentioned factors, the following options were assessed:

- Combined Cycle Gas Turbine (CCGT) Plant.
- Conventional thermal power plant (Boiler / Steam Turbine Generator).
  - Operating on fuel gas, fuel oil or coal.
- Combined Heat and Power (CHP) Plant.
- Diesel Power Plant.
- Open Cycle Gas Turbine Plant.

The technical and financial studies completed determined that a 450 MW CCGT power plant would be the optimum choice for this particular installation. The principal advantages of the CCGT over the alternatives include:

- Lower investment costs.
  - CCGT power plants have lower investment costs than coal / oil burning plants which require significant investment in emissions control technologies, fuel handling and delivery systems.
- Shorter construction periods.
  - CCGT plants are of a standardised modular design meaning components are substantially pre-engineered.
- Higher generation efficiencies.
  - CCGT plants have an energy generating efficiency of approximately 58%.
- High plant reliability and ease of operation.
  - Ease of operation due to the highly automated nature of the plant.
- Well-proven technology.
  - Gas Turbine technology has been in operation for over 20 years with continual improvement in their design, efficiencies and reliability.
- Low operating costs.
  - The standardised nature of the plant provides for standardised supplier maintenance packages.
- Lower environmental impact.
  - Low Nitrogen Oxide burners result in lower emissions compared with conventional power plants. In addition, higher efficiencies result in lower Carbon dioxide emissions.
- Compatibility with the site.
  - The single shaft arrangement of a CCGT plant allows for a compact development site.
- Availability of fuel.
  - Natural gas can be piped directly to the plant avoiding use of road and rail networks.

2.3 Alternative Sites Considered

Section 2.3.1 describes the Regional Site Selection considerations while Section 2.3.2 focuses on local considerations.

2.3.1 Regional Site Selection

Two criteria are paramount in selecting a location for a CCGT power plant:

- Connection to the transmission network.
- Proximity to fuel.

For a combined cycle power plant of the order >400 MW, the plant can only connect into the high voltage transmission network. Power is transported throughout Ireland via the 110 kV, 220 kV and 400 kV high voltage transmission network. Only the 220 kV and 400 kV infrastructure has the carrying capacity to handle a >400 MW generating plant. There are only two 400 kV lines in Ireland which run from Moneypoint to Dublin and transport the power generated directly from Moneypoint coal fired power plant into the 220 kV transmission network at Dublin.

The 220 kV network at Dublin consists of 220 kV transmission lines criss-crossing the country linked by 220 kV substations which step down the voltage further to 110 kV for further regional and local distribution. Each 220 kV transmission line is similar to a roadway with a limited capacity for transportation. Therefore, in order for transmission infrastructure to function properly and ensure that power at the required voltage and frequency is distributed to all parts of the country, the generation assets must be distributed around the country.

EirGrid controls the transmission network and indicates where there are possibilities for connecting generating stations into the network. Documents from EirGrid such as the *Transmission Development Plan 2006-2010* and *Transmission Forecast Statement 2006 - 2012* identify the future demands which will be placed on the transmission network and the potential connection points into the Grid for future generation.

Quinn Group analysed these documents to identify areas where a power plant could be suitably located and connected into the grid. These locations were further assessed with regard to proximity to a reliable fuel supply. Quinn Group initially investigated the possibilities of acquiring exisiting generation sites including some ESB sites however the timeliness regarding decommissioning of these generation sites was not compatible with the strategic timeliness of Quinn Group. Alternatives within the following regional areas were then assessed.

North West

The only 220 kV substation in the northwest is the Flagford 220 kV substation in Co. Roscommon. This area was assessed but is unsuitable for locating a combined cycle power plant due to the lack of availability of a gas pipeline in this area, the nearest pipeline being located approximately 100 kilometres from the area.

South

The Knockraha 220 kV substation in Co. Cork is a suitable connection point for large transmission, has suitable gas infrastructure, but was discounted due to two more advanced competing projects from Bord Gáis and ESB which have connection agreements with EirGrid for 2010. While Quinn Group did investigate sites in the region, plans were withdrawn due to the advanced stage of the competing projects.

South East

The Arklow 220 kV substation in Co. Wicklow was considered but was discounted due to the lack of availability of the quantities of gas required for a CCGT power plant. The nearest pipeline of sufficient capacity is located approximately 80 kilometres from the area.

West

The west was identified as a suitable for location for a combined cycle power plant and a separate development is currently being pursued by Quinn Group

North East

The Monavallet 220 kV substation in Louth is a suitable connection point to the transmission network and additionally has proximity to the gas network, (located approximately 8 kilometres from the substation). The EirGrid document *Transmission Forecast Statement 2006 – 2012* also highlights the high transfer capability of the substation.

The EirGrid document *Transmission Forecast Statement 2007 – 201,* published in August 2007, re-iterates the suitability of the Louth 220kV substation stating that:

'Over the period covered by this statement opportunities for the connection of a generator in excess of 400 MW in size were shown to exist at Gorman in Co. Meath, Flagford in Co. Roscommon and in Louth'.

The document also states that:

'It will be possible to connect a 400 MW generator at Flagford 220 kV station in 2013 or at Louth 220 kV station in 2010, although network reinforcement will be required in order to accommodate this level of generation at Louth in 2013.'

Monavallet substation (Louth) was thus selected as the best connection point for the 450 MW CCGT power plant. Subsequently, sites local to this sub-station were assessed within the area or in proximity to the 220 kV high voltage transmission lines running from the substation. Upon investigation, Quinn Group determined that there was an existing site in Platin, Co. Meath for which planning permission for a similar CCGT power plant was granted a number of years ago. The owner of this land informed Quinn Group that the site was not for sale. A greenfield site therefore had to be sought for the development. A number of greenfield sites in the Louth / Meath corridor were assessed for their suitability, however they were unavailable.

It was decided to find a site as close as possible to the substation in order to facilitate the use of a buried cable connection to the substation.

2.3.2 Local Site Selection

Seven general areas within a 3 kilometre radius of Monavallet substation were considered; **Carnalughoge, Coolcreedan, Drumcamill, Aghaglass, Comraghs, Ballintra** and **Toomes** *as illustrated in Figure 2.2.* Each site was assessed under the following criteria:

- Proximity to the sub-station.
- Screening potential.
- Avoidance of over-head lines.
- Road access.
- Proximity to sensitive receptors.
- Proximity to designated sites.

Proximity to the Substation

Proximity to Monavallet substation facilitates the use of underground cabling. The use of underground cabling is in accordance with *Louth County Council Development Plan 2003 – 2009* which states that transmission lines should be avoided in sensitive locations.

While all of the areas considered are located in relatively close proximity to the substation, Toomes is sited in an undeveloped area providing the most direct access between the proposed location and the substation. The other areas identified would require significant infrastructural constraints regarding routing of an underground cable requiring traversing of a number of streams, local and / or regional roads.

Screening Potential

The land surrounding Monavallet substation is typically low lying undulating farmland. Toomes is located within a hollow of approximately 37 metres OD (Ordnance Datum Malin Head), surrounded by areas of elevated land which rise to high points of 50 metres OD in the immediate vicinity. The other areas identified are situated in either open landscape or on elevated heights. Toomes offers the most favourable topographical screening potential. In addition the natural vegetation surrounding the site offers additional vegetative screening.

Avoidance of Overhead Lines

Powerlines associated with the substation dominant the landscape around Monavallet. Overhead lines pose a significant risk during construction and operational activities. The proximity of such lines was assessed in relation to the seven sites selected. In order to avoid the use of additional overhead lines (i.e. utilise the option for underground cabling), the sites were further assessed with regard to proximity to housing and infrastructural constraints (i.e. main roads and water courses). Toomes provided the most favourable option regarding the avoidance of both existing, and additional overhead lines.

Road Access

Local roads in the area tend to follow winding routes. In general these roads and junctions are considered unsuitable for construction traffic. Toomes offers a solution with potential access across a local road to the regional R178 road to the north of the proposed site.

Proximity to Sensitive Receptors

While all of the areas considered have a relatively low population density; Carnalughoge, Drumcamill and Ballintra were considered unsuitable due to a combination of visual impact considerations and proximity to sensitive receptors.

Proximity to Designated Sites

None of the areas identified are located within close proximity to designated areas.

A scoring system was applied to each aspect where 1 indicates poor, 2 acceptable and 3 good. *Table 2.4* illustrates the assessment criteria for each site in turn.

Table 2.4: Local Site Selection Assessment Criteria

	Carnalughoge	Coolcreedan	Drumcamill	Aghaglass	Comraghs	Ballintra	Toomes
Proximity to the sub-station	2	1	2	2	1	1	3
Screening potential (topographical & vegetative)	1	1	1	1	1	1	3
Road access	1	1	3	2	1	1	2
Avoidance of overhead lines	1	1	1	1	1	1	2
Proximity to houses	1	3	1	2	2	1	3
Proximity to designated sites	3	3	3	3	3	3	3
Total score	**9**	**10**	**11**	**11**	**9**	**8**	**16**

As illustrated in *Table 2.4* Toomes is considered to be the most favourable option for the power plant with the advantages of screening potential, ease of access to the substation, (to facilitate underground cabling) and distance from sensitive receptors. Within the Toomes area the proposed site location was the only available land at the time Quinn Group was seeking to make a purchase.

3 Description of the Development

3.1 Introduction

This chapter of the EIS provides a description of the site, neighbouring land uses and the proposed development.

3.2 Existing Environment

The existing greenfield site is located in a predominantly rural-agricultural area in the townland of Toomes, Co. Louth to the south southwest of Ballakelly Crossroads, approximately 2.5 kilometres northwest of Louth Village. Refer to *Figures 3.1 Site Location* and 3.2 *Site Context*.

The development site occupies 27.9 acres (11.3 hectares). An additional 8.1 acres (3.3 hectares), comprising a corridor around the west and southern boundary and an area of wetland to the east of the site, will remain undeveloped as an ecological mitigation measure. Refer to *Figure 3.3 Site Layout.*

Toomes has a low density of residential housing mainly comprising scattered farmhouses and discrete dwellings. The closest dwelling is located approximately 200 metres from the southern side of the outer boundary, (220 metres from the inner development site boundary). The predominant businesses in the area relate to agriculture. The area immediately surrounding the proposed site is pasture land mainly utilised by local dairy farmers. There are also a small number of businesses in the area including a haulage company, grocery store and petrol station.

A local road, the LP 1143, (Stonetown Road) is located approximately 0.75 kilometres to the north of the site. There are no watercourses in the immediate vicinity of the development site. A field drain runs along the southern boundary. Records show that historically, the area was referred to as *"bogg"* (Refer to *Chapter 12 Archaeology, Architecture and Cultural Heritage*).

The topography of the development site is of lower elevation than the surrounding lands, average 37m (Ordnance Datum Malin Head) rising to a peak of 43 metres. The surrounding lands rise from approximately 41m to high points of approximately 50 metres in the immediate vicinity. It is proposed that the development area will be elevated to a uniform 37 metres.

The Monavallet 220 kV substation, (to which the electricity generated by the plant will be exported) is located approximately 800 metres to the northeast of the development site. An underground cable will connect the power plant to the substation. The gas connection to the site will be via the Bord Gáis Networks (BGN) grid, the route will be determined by BGN.

3.3 Principal Design Objectives

Quinn Group intends to develop a 450 MW Combined Cycle Gas Turbine (CCGT) power plant at Toomes, Co. Louth. The plant will be designed to operate on natural gas as the primary fuel. The back-up fuel will be 0.1% sulphur diesel oil with a 5 day on-site storage capacity equating to approximately 10 000m^3 .

The primary objectives of the proposed development are to:

- Sell electrical power through the EirGrid 220 kV transmission system.
- Increase the base load installed capacity of the electrical generating plant in Ireland by mid-2010, (to meet the anticipated increase in system demand and the reduction in installed generation capacity by the ESB. As described in *Section 2.1 - Need for the Facility*).
- Reduce the proportion of greenhouse gas emissions per MW 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.

The new power plant will use the latest technology gas turbine units to meet the above objectives. The plant will operate continuously for up to 8 600 hours per annum but long-term will have an expected availability of 92% operating approximately 8 000 hours per annum.

This type of power plant operates successfully in many locations in Ireland, including at Tynagh, (Galway) and at Huntstown and Poolbeg, (Dublin).

The contract to supply and construct this plant will be by open international competition. The exact plant output and layout cannot be specified at this stage without prejudice or favour to a particular manufacturer. The result of a tendering process will be the award of a contract for a particular model of gas turbine. Consideration of environmental impacts is on the basis of the largest size of plant envisaged.

3.4 Main Features of the Project

The plant layout has been designed in accordance with BAT Guidance Note: *Reference Document on Best Available Techniques for Large Combustion Plants, (adopted July 2006)* for the production of energy.

Natural gas supplied from the BGN grid will be the main fuel for the plant. The electrical power generated will be exported from the new 220 kV substation to be constructed at the Toomes site through a 220 kV underground cable, which in turn will connect to the nearby ESB 220 kV substation at Monavallet, approximately 800m to the northeast of the development site.

Two configurations for the plant are possible. The "single shaft" arrangement consists of gas turbine, steam turbine and generator arranged on a single shaft or powertrain. The alternative "multi-shaft" option would comprise a gas turbine and steam turbine each with its own dedicated generator. The smaller layout single shaft option will be employed for the proposed plant. Consequently, the layouts included with the planning application are based on a "single shaft" arrangement. However, it should be noted that the "single-shaft" layout and arrangement of CCGT suppliers differs only marginally in size and layout of smaller auxillary components.

3.5 Plant Design

The CCGT plant will incorporate the following process:

1. A gas turbine burning natural gas will drive a generator for electricity production.

2. Exhaust gases from the gas turbine will pass through a heat recovery steam generator (HRSG) to generate very high-pressure steam.

3. The steam generated in the HRSG will drive a steam turbine, which will also turn the generator to provide further electrical power.

The proposed plant will employ the most recently developed CCGT technology in compliance with all relevant international codes.

A schematic of the process is provided in *Figure 3.4 Steam Cycle Schematic*.

3.6 Plant Components

The principal components will include the following:

- Gas Turbine Generator (GTG).
- Heat Recovery Steam Generator with exhaust stack (HRSG).
- Steam Turbine Generator (STG).
- Diesel storage tank, (10 000m^3).
- Water treatment plant.
- Sodium Hydroxide storage tank, (10m^3).
- Sulphuric Acid storage tank, (10m^3).
- Water storage facilities.
- Process waste water discharge pit.
- Surface water attenuation tank.
- Foul water package treatment system.
- Air Cooled Condenser (ACC).
- Above Ground Gas Installation (AGI) and associated piping.
- Transformers.
- High Voltage Electrical Switchgear.
- Fire protection system.
- 220 kV substation.
- Building structures to house main plant as described above.
- Workshop / stores building.
- Administration / control building.
- Internal roads and parking.
- Access road to the site.

3.7 Processes and Facilities

3.7.1 Combined Cycle Process

The combined cycle process consists of two thermodynamic cycles, the *Brayton* and *Rankine* cycle working together to produce electricity as efficiently as possible, hence the name combined cycle.

The first cycle comprises a gas turbine and an electrical generator coupled together on one main shaft, which rotates at high speed. The gas turbine consists of a compressor section, a combustion chamber and a turbine section. Air is drawn in through an intake filter, compressed and fed into the combustion chamber where fuel is injected and ignited. The resulting hot combustion gases (1300^{o}C) passing through the turbine section rotate the shaft driving the compressor and the electrical generator to produce the rated electrical power output. The expansion of the hot gases through the turbine, and the extraction of mechanical work from them, (via the turbine) reduce the temperature of the gases to approximately 600^{o}C at the exit of the gas turbine.

Operation of a gas turbine as described above is referred to as open or simple cycle mode. However, it is possible to generate approximately 50% more electricity from the hot exhaust gases by passing them through a Heat Recovery Steam Generator (HRSG) or boiler, which reduces the exhaust gases down to approx 100 ^{o}C on exiting the HRSG stack by using the heat to generate steam (by boiling water in the HRSG), which is fed to a steam turbine. The gases are discharged to the atmosphere via an exhaust gas stack located at the outlet of the HRSG.

The high pressure steam produced in the HRSG is supplied through inter-connecting pipework to the steam turbine which is coupled to the same generator as the gas turbine (hence 'single shaft'), further driving the generator to generate more electricity. The steam is expanded in the steam turbine down to vacuum conditions to extract as much energy as possible and 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. This is the Rankine thermodynamic cycle and the two cycles working together form the 'Combined Cycle Process' to convert as much energy as possible from the fuel into electrical energy.

Feed water for the HRSG / Steam Turbine water-steam cycle is pre-treated in the water treatment, (demineralisation) plant to achieve high purity and stored on site prior to use in two tanks with a combined storage of 10 000 m^3. This capacity is sufficient to provide for injection water to the gas turbine for emissions control purposes while firing on diesel. The electricity generated is fed to a transformer where the voltage is increased to 220 kV. Raw, (untreated) water will be stored in a storage tank of at least 2 000 m^3 capacity prior to being fed to the demineralisation plant.

The low-pressure steam exiting from the steam turbine is condensed before returning to the HRSG where it is converted to high pressure and temperature steam. This low-pressure steam must be cooled and converted to hot water (condensate) in the ACC in order to pump it back to the HRSG. Therefore the condensing process requires large quantities of cold air to cool the steam to condensate.

Air Cooled Condensers do not include a cooling water circuit. In the air cooled configuration the steam is ducted to a large array of air cooled condenser tubes located at some distance from the steam turbine. Air is forced through the finned condenser tubes by an array of electrically driven forced draught fans. Heat is transferred from the steam to the air, effectively condensing the steam to hot water (condensate). Air cooled condensers are typically arranged in "A" frames and require a considerable amount of plot plan area but have the advantage over cooling towers of no water consumption.

3.7.2 Dry Low Nitrogen Oxide Burners

Combustion in gas turbines has traditionally employed a diffusion flame where fuel is sprayed into the centre of an air stream. Fuel mixes with the air by turbulent diffusion and the flame temperatures reach approximately 2 000°C. The hot combustion products are cooled by dilution with excess air to temperatures acceptable to the combustor walls and turbine blading.

Nitrogen oxides (NO_x) are formed at high temperature by the dissociation of the Oxygen (O_2) molecule and the action of the Monoxide (O) radical on molecules of Nitrogen. At temperatures above 1 500°C, NO_x was formed from nitrogen in the atmospheric air taking part in the combustion process, the product being denoted *Thermal* NO_x. Initial attempts to reduce NO_x introduced a heat sink in the flame by injecting water, with the aim of reducing average combustion temperature and hence thermal NO_x production. However, the process required large quantities of clean water to avoid corrosion of the turbine blading or deposition and blocking of cooling air holes by impurities.

The high costs of the systems detailed above provided the incentive to explore the use of non-stoichiometric (chemical conversion), mixtures to reduce flame temperature in so-called dry low- NO_x (DLN) systems. If fuel and air are mixed before combustion in a "*pre-mix flame*", the combustion temperature, and therefore the NO_x formed, is a strong function of the fuel–air ratio. By using a lean fuel / air mixture the rate of NO_x formation can be significantly reduced.

For low NO_x production the primary fuel / air mixture is very lean so, for stable and efficient combustion, a pilot flame and various geometric arrangements are employed to maintain ignition of the main mixture. No water injection is thus required to maintain low NO_x emissions. The combustor can be dual fuelled but, for liquid fuel i.e. diesel, a diffusion flame is employed with water injection.

3.7.3 Plant Efficiency

The plant will have an efficiency of approximately 58%, i.e. 58% of the thermal energy of the fuel will be converted to electrical energy. Most of the heat loss will be via the ACC from the low-pressure steam to the ambient air. The remainder of the overall cycle losses can be accounted for as both mechanical and electrical losses within the plant. The plant will employ Best Available Technique (BAT) technology recognised for being the most advanced for power production on the scale proposed. The high overall efficiency will lead to lower specific emissions to the environment generally compared to any other form of conventional thermal power plant.

3.7.4 Plant Facilities

Above Ground Installation

The fuel (natural) gas will be supplied from the BGN gas network at a minimum guaranteed pressure of 20barg and 15°C, (the BGN gas pipeline is normally pressurised to 70barg). This gas will pass through a gas conditioning plant located in the AGI compound and will comprise:

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

- Pressure reducing station.
- Electrical switchroom / control room.

Gas Turbine Generator (GTG)

The GTG will essentially comprise a multi-stage axial-flow compressor section with movable inlet guide vanes, a combustion chamber with several burners, and a multi-stage axial-flow turbine section. Natural gas will be burned using air from the air compressor. The hot gas will pass through the turbine blades. Mechanical energy will be converted to electrical energy in the electrical generator coupled to the gas turbine. The exhaust gas will pass to the HRSG.

Heat Recovery Steam Generator (HRSG)

Exhaust gases from the gas turbine will be used to produce the high-pressure steam which will feed a steam turbine. The cooled exhaust gas will then be expelled to the atmosphere via a 60 metre high stack. The HRSG will be multi-pressure type.

Exhaust Gas Stack

A 60 metre high stack will be provided to release the products of the combustion process (exhaust gases) to the atmosphere. *Chapter 9 Climate and Air Quality* provides an assessment of the impact from exhaust stack emissions.

Back-up fuel

Although the CCGT will normally be fuelled by natural gas, diesel storage and pumping facilities will also be provided. To comply with the requirements of the Commission for Electricity Regulation (CER) the storage capacity of the back-up fuel supply should be such as to allow the plant to be operated continuously at its full output for a period of 5 days, (i.e. approximately 10 000m^3). Diesel will be stored in a vertical cylindrical steel tank within a 110% capacity bund to comply with this requirement. The bund will be constructed in accordance with *CIRIA Report 163 "Construction of bunds for oil storage tanks" and BS8007:1987, Code of practice for design of concrete structures for retaining aqueous liquids*).

The diesel will be delivered via road tanker.

The quantity of diesel to be stored on site accords a lower tier Seveso designation under the *European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations, 2000,* (commonly referred to as the Seveso II Directive). In accordance with the requirements of this regulation, in regard to a lower tier site, the Health & Safety Authority (HSA) will be notified at least six months prior to commencing construction of the facility and a Major Accident Prevention Policy (MAPP) will be prepared prior to commencement of operation of the facility. The requirements of the Seveso II Directive are described in *Section 3.12 - Seveso II Directive.*

Steam Turbine Generator (STG)

The steam turbine will be of a multiple cylinder type suitable for direct coupling to the two-pole generator for power generation at 50 Hz. The thermal energy of the steam generated by the HRSG will be converted to mechanical energy in order to drive a generator to produce electrical power. The low-pressure exhaust steam will flow radially out of the steam turbine to the air cooled condenser.

Air Cooled Condenser (ACC)

The low-pressure exhaust steam will pass through the finned condenser tubes over which cooling air is passed via forced air fans, (fin fans). Heat is transferred from the low-pressure steam to the air by forced convection, condensing the steam to water, (condensate).

Mechanical Auxiliary Plant

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

Demineralised Water Plant

An on site water treatment plant will be required, where water for use in the HRSG will be treated to achieve a high purity. The water treatment process will consist of filtration, and either a resin based or Reverse Osmosis and Electro De-ionisation (EDI) based treatment system with pH adjustment by sulphuric acid (H_2SO_4) and Sodium Hydroxide (NaOH).

Boiler Feedwater Chemical Treatment

The HRSG feedwater will be thermally de-aerated (removal of air) and chemically controlled to prevent corrosion. Chemical dosing for pH control essentially alters the pH of the boiler water to a pH that is unsupportive of the corrosion reactions. Oxygen scavenging and de-aeration combine to remove the dissolved oxygen from the boiler water which again prohibits corrosion.

Chemical treatment options available are Ammonia (NH_3), Sodium Hydroxide (NaOH) and Tri Sodium Phosphate (Na_3PO_4). Ammonia is the preferred treatment option however as Sodium Hydroxide and Tri Sodium Phosphate use can cause operational difficulties in the HRSG. Consequently, NaOH and Na_3PO_4 are generally only used in emergency situations, for example, if poor quality untreated feed-water has entered the system.

Electrical Transformer

The electricity generated will be fed to a generator transformer where the voltage will be stepped up to 220 kV. The switchyard will comprise control building, electrical equipment and masts (less than 10 m in height). It will be an outdoor, three phase unit of the oil immersed design. It will be bunded and blast protected with a deluge system for fire protection, power will flow from the transformer to the 220 kV substation at Monavallet and onto the national grid. The design and layout of the electrical plant will comply with the technical requirements of EirGrid.

Process Water Discharge Pit

Process waste water comprises water from the demineralisation plant and boiler "blow-down". Waste water from the demineralisation plant comprises water containing the salts removed from the raw water or neutralised backwash of the resins from the demineralisation process. Boiler blow-down comprises water which has been circulating in the water / steam cycle. In order to remove the build up of salts from the HRSG drums, (which remain in the drum once the water has evaporated off) it is necessary to continually "blow-down" 1% of the total 400m^3/hr (i.e. 4 m^3/hr) of circulating water.

The process waste water will be collected and treated in a 1 200m^3 below ground concrete discharge pit from where its quality and temperature will be monitored prior to discharge. The pit 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, if required, to regulate the pH to 6-9. The water then overflows from this chamber into the final main discharge chamber. Dissolved oxygen, pH, conductivity and temperature will be continuously monitored, 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 waste water is within the limits the waste water will be pumped to the discharge point.

The process water discharge outlet will also be fitted with an automatic sampler which will sample water discharges over a given period as directed by the EPA under the IPPC regime. An on site laboratory will also be provided to facilitate monitoring of specific parameters on site.

The maximum quantity of process waste water to be discharged from the power plant during normal operations will be 150m^3/day. In abnormal situations, such as a boiler shut-down, up to 250m^3/day of process waste water may be discharged. Based on existing operational CCGT power plants it is envisaged that a boiler shut-down will be required a maximum of once per annum.

Process waste water discharge is discussed in detail in *Chapter 13 Water.*

Surface Water Attenuation Tank

Surface water will be collected in a below ground 6 000m^3 concrete attenuation tank. All surface water runoff will be discharged to the tank via a hydrocarbon interceptor and silt trap. Surface water run-off will be discharged to the Glyde River in accordance with Sustainable Urban Drainage System *(*SUDs) guidance.

Surface water discharge is discussed in detail in *Chapter 13 Water.*

Foul Water Package Treatment System

Foul water, (waste water other than process waste water and surface water) will be treated in a proprietary secondary treatment system prior to discharge. The treated water will either be discharged to the Glyde River or percolated to ground, based on the findings of a site suitability assessment. The system will be designed to serve 50 persons in accordance with *BS6297: Code of Practice for Design and Installation of Small Sewage Treatment Works*, guaranteeing treatment of the treated waste water to 25 mg/l Biological Oxygen Demand and 35 mg/l Suspended Solids.

Treated foul water discharge is discussed in detail in *Chapter 13 Water.*

3.7.5 Plant Structures

The development will comprise of the main structures listed below. Dimensions given below are regarded as maxima and height dimensions in particular may be reduced depending on the equipment of the successful tenderer.

Table 3.1: Dimensions of Main Enclosures

Name	Length	Width	Height
Turbine Building	81	48	30
Heat Recovery Steam Generator	36	30	40
Electrical Building	44	17	12
Administration Building	23	14	10
Workshop & Stores	52	14	8
Control Room	20	14	8
Gate House	6	6	4
Water Treatment Plant	43	20	7
Exhaust Stack	-	7.5 diameter	60
ACC	60	46	33
Fire Pump House	9	9	8
Fuel Oil supply pumps canopy	5	5	4
Gas Plant Boilerhouse	21	8	5
220 kV switchyard	15	10	5.5

Some of these buildings may be subdivided depending on the final choice of plant. Refer to *Figure 3.5 Site Elevations*

The structural form of the main buildings will be conventional structural steel supported on reinforced concrete foundations. Steel columns will be fire protected as necessary to comply with the building regulations. Floors will be concrete. The administration building and some of the smaller buildings will be of fair-faced blockwork construction on concrete strip foundations. Profiled metal cladding will be used for external walls. The finished colour of the plant structures will be designed to favour the reduction of potential visual impacts. Non reflective finishes will be used in order to reduce or avoid impacts relating to sunlight reflection or glare. Finished colours will be determined at the detailed design stage and will blend as much as possible with the surrounding landscape.

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

External doors and escape doors will generally comprise of metal flush doors and mild steel frames. Fire doors will comply with *BS 476-22:1987 - Fire tests on building materials and structures*.

3.7.6 Materials Used

The principal materials used will be as follows:

Natural Gas

Natural gas will be delivered to the station via a new below ground high-pressure (20 barg) pipeline from the existing Bord Gáis Network.

Diesel Oil

Diesel oil, for use as stand-by fuel, will be stored in a bulk storage tank contained within a 110% bund. Diesel will be delivered by road tankers.

Hydrogen

The generator is filled with Hydrogen as a closed circuit cooling medium. The hydrogen is continually topped up by small amounts via a bottle storage system.

Water

Water for use in the HRSG will be stored in bulk storage tanks filled by the supply from the local Killany-Reaghstown Group Water Scheme (up to $10m^3$/hr). This storage will also serve as the supply for fire fighting purposes and to provide for injection water to the gas turbine for emissions control purposes while firing on diesel. Refer to Chapter 13 *Water* for a description of the water supply.

Bulk Chemicals

Processes in the water treatment plant will utilise Sulphuric Acid (H_2SO_4) and Sodium Hydroxide (NaOH) will be delivered by road tanker and stored on site in $10m^3$ capacity bunded storage tanks. To maintain optimum boiler and steam conditions the HRSG will be dosed with small amounts of Ammonia (NH_3), Sodium Hydroxide (NaOH) or Tri-Sodium Phosphate (Na_3PO_4) and an oxygen scavenger, dilute Carbohydrazide ($CO(NHNH_2)_2$). Ammonia, Tri-Sodium Phosphate and dilute Carbohydrazide will be delivered in IBC's by HGV and stored on site in bunded designated areas at the Water Treatment Plant.

Oils and Greases

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 HGV and will be stored in a designated bunded area at the stores building.

3.8 Design Constraints

Ecology

Following ecological assessments of the site it was recognised that a proportion of the site should remain undeveloped to protect part of the existing habitat on the site. The layout of the plant was thus designed to ensure that valuable portions of the habitat could be protected. This was done in consultation with the National Parks & Wildlife Service and involved relocating the main components to the eastern portion of the site.

Landscape & Visual

Due to the topography of the surrounding area it was recognised that best use of the natural topographical screening of the surrounding hills could be utilised by locating the higher components of the CCGT in the narrower eastern portion of the site. Locating the stack to the east of the site thus reduces the visual impact on residents located to the south and west.

Noise

Following identification of the nearest sensitive receptor it was decided that the loudest components (Turbine Hall & Air Cooled Condenser) would be located as far within the site as possible to minimise the impacts of noise. In particular, the power train was oriented so that the ACC was located as far in the eastern section of the site as possible.

Cooling

Due to the site being inland and seawater cooling not being available it was decided to use a method of cooling which required the minimum amount of water thus an Air Cooled Condenser was selected rather than a cooling tower. While the ACC has a higher profile than a cooling tower, it consumes no water and does not have plumes rising from it.

3.9 Construction Activities

3.9.1 Construction Phase Description and Duration

It is expected that construction will commence in early 2008. Civil, mechanical, electrical works and commissioning of plant are expected to last for approximately 30 months. Construction activities are expected to peak from July 2009 to May 2010.

Expected timelines for civil construction works, some of which overlap, are described in *Table 3.2* below.

Table 3.2: Construction Timelines

Construction Activity	Expected Duration
Construction of access road	2 months
Site clearance	2 months
Grading of development area	4 months
Excavation to required depths for foundations	6 months
Pile driving (if necessary), both driven and bored	6 months
Pouring of foundations	10 months
Backfilling of site to site level (37m)	10 months
Excavation for buried services	10 months
Structural steel works (Building Superstructures)	12 months

Construction activities will gradually phase out from predominantly civil activities to predominantly mechanical and electrical erection activities.

Mechanical and electrical works are expected to extend for 18 months and will comprise installation of the following:

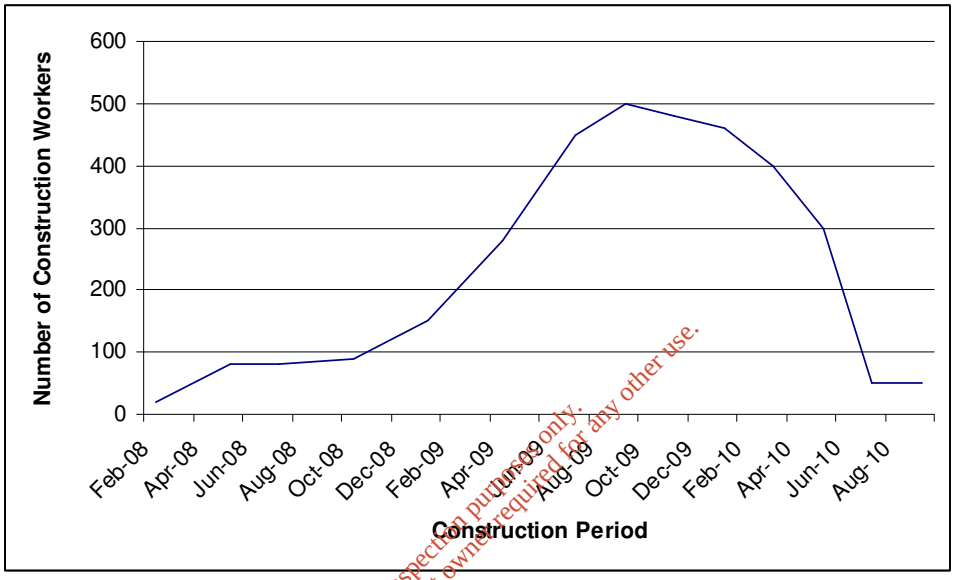
- Gas turbine generator.
- Heat recovery steam generator, (with exhaust stack).
- Steam turbine generator.
- Diesel storage tank and associated bund.
- Water treatment plant and water storage facilities.
- Chemical storage tanks and associated bunds.
- Below ground storm water attenuation tank.
- Process water discharge pit.
- Air cooled condenser.
- Above ground gas installation and piping to supply the new plant.
- Transformers.
- High voltage electrical switchgear.
- Fire protection system with on site storage tanks.
- On-site 220 kV substation.
- Building structures to house main plant as described above.
- Workshop / stores building
- Administration / control building and associated systems.
- Internal roads and parking.
- Connection to the Bord Gáis Networks (BGN).
- Connection to the EirGrid substation.
- Piping & cabling.

The component parts are modular in design and will be delivered whole and assembled on-site.

3.9.2 Construction Staff and Facilities

During the peak construction period it is anticipated that up to 500 construction workers will be employed on site. *Figure 3.6* illustrates the estimated peak construction period from July 2009 to May 2010.

Figure 3.6: Peak Construction Period



Temporary facilities will be provided on site during the construction period including portacabins, welfare facilities, car parking and laydown areas.

Normal working hours during the construction period are expected to be Monday to Friday 08.00 to 20.00 and Saturday 08.00 to 17.00. 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.

3.9.3 Site Preparation

Prior to the commencement of construction activities the area for development will be fenced off. The footprint of the proposed facility will require clearing and levelling. There is a level difference of approximately 7m across the development site. It is expected that the development site will be elevated to 37m above Ordnance Datum Malin Head. A preliminary geotechnical investigation has been carried out, as detailed in *Chapter 11 Soils, Geology and Hydrogeology,* based on the findings it is not envisaged that blasting will be required on site.

The topsoil layer will be cleared across the development site. Where possible this material will be reused on site. If the material is considered unsuitable for reuse on site an outlet for off site reuse will be sought. If reuse is not possible the material will be removed to a licensed facility by licensed waste contractors for composting or disposal as appropriate.

Bulk soil, sub-soils or other material will be stored in designated areas only. Only uncontaminated material will be imported for civil construction works. No construction material will be placed in the areas segregated for ecological mitigation. The appointed contractor will not be permitted to use any of the identified areas of ecological mitigation for any activity relating to construction.

In order to mitigate against the contamination of water by soil and sediment run-off it is proposed that a sediment trap will be installed on site during the construction phase. Water from the sediment trap will be discharged to the Glyde River via the discharge pipe, (which will be constructed prior to the commencement of construction activities).

3.9.4 Construction Phase Site Management

Quinn Group 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 Quinn Group 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 sections of this EIS. The CEMP will be reviewed regularly and revised as necessary to ensure that the measures implemented are effective.

3.10 Operational Phase Site Management

Prior to commencement of operations Quinn Group will employ a suitably qualified and technically competent Contractor who will have responsibility for the manning and day to day operation and maintenance of the site as well as monitoring and reporting of emission controls. The contractor selected by Quinn Group 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 Quinn Group. All major items of power generating plant will be covered by long term service agreements to ensure safe and efficient plant operations.

3.11 Regulatory Control of the Facility

The facility will be regulated by the following authorities:

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

EPA

The facility will operate under an Integrated Pollution Prevention and Control (IPPC) licence regulated by the EPA. The licence will set operational, monitoring and reporting conditions which Quinn Group will be obliged to comply with. The EPA is also responsible for issuing Greenhouse Gas Emission Permits and regulating the monitoring reporting and verification of emissions from facilities which come under the regime.

CER

The following licences, granted by the CER, are required:

- Authorisation to Construct; and
- Licence to Generate Electricity.

The facility will be required to comply will all of the conditions set out in each licence.

HSA

The HSA has responsibility for the regulatory control of facilities which come under the Seveso II Directive requirements.

3.12 European Regulations and International Agreements

The following lists the main Directives, Regulations and Agreements which apply to the proposed development:

- The Integrated Pollution Prevention and Control (IPPC) Directive (96/61/EC).
- The European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2000 – commonly referred to as the Seveso II Directive.
- The Large Combustion Plant Directive (LCPD) 2001/80/EC.
- The National Emissions Ceiling Regulations (NEC) Directive 2001/81/EC.
- The Kyoto Protocol to the UN Framework Convention on Climate Change (UNFCCC) – Emissions Trading Scheme.
- Greenhouse Gas Emissions Trading Directive 2003/87/EC.

IPPC Directive (96/61/EC)

The IPPC Directive aims to prevent or minimise pollution from new and existing installations which come under the regime through an integrated licensing system. The IPPC Directive was transposed into Irish law under the *Protection of the Environment Act, 2003*. The First Schedule of the Act describes the activities that require an IPPC licence including:

"Energy: The operation of combustion installations with a rated thermal input equal to or greater than 50 MW."

Under the Act an IPPC licence is required to operate, prior to issuing a licence the EPA must be satisfied that the installation does not cause adverse effects on the environment.

An IPPC licence sets conditions and requirements in order to prevent or reduce emissions to air, water and land and reduce waste and noise. Conditions on the prevention of accidents, efficient use of energy / resources and decommissioning of plant are also set. Under the regime the operator is obliged to employ Best Available Technique (BAT) technology and follow BAT guidance documents. The BAT guidance appropriate to the proposed development is BAT Guidance Note: *Reference Document on Best Available Techniques for Large Combustion Plants, (adopted July 2006).* The conditions of the licence include emission limit values (ELV's), monitoring and reporting requirements. In addition any significant changes to the facility must be notified to the EPA in advance of any change taking place.

Seveso II Directive

The Seveso II Directive is implemented through the *European Communities (Control of Major Accident Hazards Involving Dangerous Substances), Regulations 2006 (SI No 74 of 2006)* which gives effect to Council Directives 96/82/EC and 2003/105/EC. The regulations apply to facilities where dangerous substances are held in quantities above specified threshold limits as specified in Annex I Parts 1 and 2. Two thresholds apply Lower-tier and Higher-tier. Operators of facilities which come under the regime are required to take all necessary measures to prevent and mitigate the effects of major accidents to human beings and the environment.

The Regulations define a major accident as:

" an occurrence such as a major emission, fire or explosion resulting from uncontrolled developments in the course of operation of any establishment, leading to a serious danger to human health or the environment"

Under the regulations the operator is required to do the following:

- Notify the HSA at least six months prior to commencement of construction activities providing clearly defined details in relation to the operator, relevant dangerous substances, inventories, description of the activity and details of the immediate environment of the activity. Any significant changes to the facility must also be notified in advance.
- Implement an Emergency Plan.
- Implement a Safety Management System.
- Develop Risk Assessments.
- Implement a Major Accident Prevention Plan (MAPP).

The regulations also impose planning restrictions both within and adjacent to the facility thereby controlling development that is incompatible with operations.

Due to the quantity of diesel being stored on site, (10 000m^3) the proposed facility will be designated a Lower-tier Seveso site.

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

The LCPD was adopted in 1988 and subsequently revised in 2001. The Directive applies to all plants with a rated fuel input greater than 50 MW imposing limits on emissions of Sulphur Dioxide (SO_2), Nitrogen Oxides (NO_x) and dust.

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

The NEC Directive imposes limits on member states regarding the emission of Sulphur Dioxide (SO_2), Nitrogen Oxides (NO_x), Volatile Organic Compounds (VOC's) and Ammonia (NH_3) to the levels specified in the Directive by 2010.

The Kyoto Protocol

The Kyoto Protocol sets mandatory emission limits for the reduction of Greenhouse Gas Emissions (GGE). Ireland is committed to limiting GGE to 13% above its 1990 levels during the period 2008-2012. Current levels are more than 25% above 1990 levels. The EU Council of Ministers has recently committed to achieving a 20% reduction in emissions of 1990 levels by 2020. The Greenhouse Gas Emissions Trading Agreement facilitates the aims of the Kyoto Protocol.

Greenhouse Gas Emissions Trading Directive 2003/87/EC

Under Directive 2003/87/EC listed operators are allocated greenhouse gas emission allowances at the beginning of each year. If the operator does not meet their target they can buy or sell allowances within the EU. Combustion installations with a rated thermal input exceeding 20 MW are included in the scheme.

3.13 Decommissioning of Plant

The plant, in its current form, is expected to be operational for at least 25 years. On cessation of activities the plant will either be redeveloped as a power generating facility or the site will be redeveloped in an alternative form. Considering the proximity of the site to the grid connection it is envisaged that the site will remain a power generating facility.

In the event that the facility is decommissioned the following programme will be implemented:

- All plant equipment and machinery will be emptied and dismantled and stored under appropriate conditions until it can be sold. If a buyer cannot be found the material will be recycled or disposed of through licensed waste contractors and hauliers. If plant and machinery is required to be cleaned on site prior to removal all necessary measures will be implemented to prevent the release of contaminants.
- All chemicals, (including oils) and waste will be removed from the facility.
- The site and all associated buildings will be secured.
- All associated licences and permits will be surrendered.

Waste will be recycled wherever possible. All waste movement, recycling and disposal operations will be controlled by licensed waste contractors.

A detailed decommissioning plan will be submitted to the EPA under the IPPC licence application regime.

4 Planning & Policy Context

4.1 Introduction

This Section outlines the Planning and Policy context of the proposed development. National and Regional Policy Guidance is provided in the following:

- *National Spatial Strategy for Ireland 2002 - 2020*
- *Energy Policy Framework 2007 - 2020 (Delivering a Sustainable Energy Future for Ireland)*
- *Regional Planning Guidelines 2004*
- *Louth County Council Development Plan 2003-2009 (Adopted July 2006)*

4.2 National Policy Guidance

National Spatial Strategy 2002 – 2020

The National Spatial Strategy (NSS) is *"a twenty year planning framework designed to achieve a better balance of social, economic, physical development and population growth between regions."*

In order to drive development the NSS proposes that areas of sufficient scale and critical mass will be built up through a series of gateways and hubs. Dundalk has been designated a new national level gateway within the Dublin-Belfast corridor supporting a wider broader area extending westwards from Dundalk underpinning cross-border communication. Monaghan was also identified as a hub complementing the role of Dundalk as a gateway linking out to the wider rural area. Refer to *Figure 4.1 National Spatial Strategy, (Gateways and Hubs)*

The recognition of Monaghan and Dundalk is expected to energise the potential arising from increased cross-border co-operation driving development of the central and eastern parts of the border area as well as encouraging new cross-border linkages.

Dundalk and its environs had a population of 32 505 in 2002 which rose by 8% to 35 085 in 2006. The population in the Killanny area (in close proximity to where the proposed site is located) rose by 15.2% from 593 in 2002 to 683 in 2006, while the population of Co. Monaghan increased by 6.5% during the same period. The need for additional generating capacity to augment the grid due to accelerated growth in the Border Region was highlighted in the NSS. The anticipated continued increase in population will consequentially increase the demand for employment within the area.

Government White Paper – Delivering a Sustainable Energy Future for Ireland (Energy Policy Framework 2007 – 2020)

Security of supply is identified as crucial for economy and society in the Government White Paper entitled *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.

The Government endorses the case for a process of structural change in the energy market; a key policy objective is the enabling of competition and delivery of consumer choice through structural change.

The paper also highlights the need for additional electricity generating capacity and improved availability of existing generating stations with the following statement:

"Achieving an adequate safety margin between electricity supply and demand requires additional generating capacity including flexible plant and significantly higher standards of generating plant availability, as well as more interconnection.…We will ensure that the strategic network development approach is underpinned by coordinated local, regional and national approaches to issues, which balance local interests with the national imperative to deliver strategic energy infrastructure. This approach will be supported by the new arrangements provided for in the Planning and Development (Strategic Infrastructure) Act 2006".

4.3 Regional Policy Guidance

The Border Regional Authority is one of eight Regional Authorities established with effect from 1st January 1994, under the provisions of the *Local Government Act, 1991 (Regional Authorities) (Establishment) Order, 1993*. This Establishment Order was made by the Minister for the Environment with the consent of the Minister for Finance under Sections 3 and 43 of the Local Government Act, 1991.

The Border Regional Authority covers the counties of Cavan, Donegal, Leitrim, Louth, Monaghan and Sligo situated along the southern side of the border. This comprises an area of some 12 156 sqaure kilometres with a population in excess of 432 000. The authority has prepared regional policy guidelines, the objective of which is to provide a long term strategic planning framework, for the implementation of the National Spatial Strategy at Regional Level.

These guidelines take the form of a single document and act as a regional framework for the development plans. The relevant county development plan is the *Louth County Council County Development Plan 2003-2006, (Amended July 2006).*

4.4 Louth County Council County Development Plan 2003-2009

The Louth County Development Plan is a comprehensive six year plan required to be developed by each local authority. The main underlying theme throughout the plan is sustainable development.

The plan divides the county into six different Development Control Zones. Toomes is in Development Control Zone 6 which allows for small scale industries, resource-based developments, public utility infrastructure and other uses which by their nature and scale are considered appropriate within this zone. The development plan also highlights that the strategy does not preclude the location of industrial / commercial activity anywhere in the county where consideration will be given on the merits of each individual proposal. There are no strategic development zones identified in County Louth.

The report entitled *Locating Industry in Co. Louth 2001*, (now incorporated into the County Development Plan 2003-2009) identifies strategic locations outside of the larger towns of Drogheda, Dundalk and Ardee such as Louth Village and the need for greater employment opportunities in smaller settlements and in rural areas. It is a stated policy to secure a spread of employment opportunities at key strategic locations throughout the county in order to sustain and revitalise rural communities where traditional employment sources, such as agricultural, are in decline. It is considered that this development would be appropriate within this zone due to the small employment numbers of the facility (approximately 36 permanent employees) being appropriate to the area around Louth Village.

The development is also considered appropriate in light of the presence nearby of the Monavallet 220kV substation which is the necessary infrastructure required for connection of generation facilities which are required on a national and regional level.

The council also has a policy included in this development plan on Cables, Masts & Pylons. In particular; transmission lines should be avoided in sensitive landscapes, new transmission lines masts and pylons should have regard to existing residential amenity and should avoid any views of scenic amenity value and the construction of electricity poles, masts, and pylons will be subject to the least harmful route. The proximity of Toomes to the Monavallet substation makes it viable to connect to the Grid by way of buried cable and avoid the use of overhead transmission lines thereby complying with the policy set out by Louth County Council. Avoidance of overhead lines was included in the site selection process as discussed in *Section 2.3.2.*

The development plan deals in one section specifically with industrial developments and highlights some aspects which have been taken into account in the development i.e. parking, landscape, building design, water and noise. These are addressed in the various applicable sections of this EIS.

The County Development plan specifies that industrial developments should be finished to a high standard and that the 'good neighbour' principle should apply. The proposed development will utilise the latest proven combined cycle gas turbine technology in accordance with Best Available Technique (BAT) technology: *"Reference Document on Best Available Techniques for Large Combustion Plants"* published by the European Commission in July 2006 .

4.5 Planning Application Strategy

The strategic infrastructure provisions of the Planning and Development (Strategic Infrastructure) Act 2006 came into effect on 1st January 2007. The Act, which amends the Planning and Development Act 2000, requires that planning applications for certain developments are made directly to the Board. Part 18 of the *Planning and Development Regulations 2006 (S.I. No. 685 of 2006)* relating to strategic infrastructure development also came into effect on 31st January 2007. The 2006 Regulations amend the *Planning and Development Regulations 2001*.

The Seventh Schedule to the Act lists the classes of infrastructure development which, if considered by the Board to be strategic infrastructure development, would require direct application for permission to the Board instead of the local planning authority. These generally relate to major energy, transport and environmental infrastructure projects. The statutory provisions provide for up to three stages – pre-application consultations; scoping of the EIS; and the application for permission.

To qualify as strategic infrastructure development the Board must be satisfied that the proposed development, if carried out, would fall within one or more of the following categories namely -

(a) "the development would be of strategic economic or social importance to the State or the region in which it would be situate,

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

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

It is a mandatory requirement for a prospective applicant for planning permission for strategic infrastructure development listed in the 7th Schedule to enter into pre-application consultations with the Board and obtain notice from the Board stating whether or not the proposed development is regarded as strategic infrastructure development. Pre-application consultations were held with An Bord Pleánala on 25th May and 8th August 2007.

This development is *"a thermal power station or other combustion installation with a total energy output of 300 megawatts or more"* and thus is a Seventh Schedule development as defined in the Act. As the Board has given written notice to Quinn Group, subsequent to mandatory pre-application consultations, that the development is Strategic Infrastructure, the application will be made directly to the Board and not to the local planning authority.

The application procedure differs in that the application will be made direct to the Board with copies of the application sent to the relevant local planning authority(s). As the new site access roadway will cross the Louth / Monaghan border a copy of the application will be sent to both Louth and Monaghan Planning Authorities, however the main development is in the area of the Louth Planning Authority.

There is a requirement for the planning authority for the area to prepare and submit a report to the Board within ten weeks of receipt of the application by the Board. The report will set out the views of the authority on the effects of the proposed development on the environment and/or the proper planning and sustainable development of the area of the authority having regard to the usual considerations as set out in section 34(2) of the 2000 Act, as amended.

4.6 Conclusion

The proposed development has been identified by An Bord Pleanála as being Strategic Infrastructure. It will contribute to fulfilling the objectives of the National Spatial Strategy and also the objectives of the Louth County Development Plan strengthening energy networks and providing a new source of employment of a scale suitable for the locality of Louth Village.

5 Landscape and Visual

5.1 Introduction

This chapter of the EIS presents the results of the assessment of landscape and visual impacts.

The chapter considers effects upon:

- landscape character and resources, including effects on the aesthetic values of the landscape, caused by changes in the elements, characteristics, character and qualities of the landscape as a result of development, including all its component parts; and
- visual amenity, including effects upon potential viewers and viewing groups caused by change in the appearance of the landscape as a result of the proposed development.

Landscape character and resources are considered to be of importance in their own right and are valued for their intrinsic qualities regardless of whether they are seen by people. Impacts on visual amenity as perceived by people are therefore clearly distinguished from, although closely linked to, impacts on landscape character and resources. Landscape and visual assessments are therefore separate, although linked procedures.

The remainder of the chapter presents:

- Methodology (*Section 5.2*);
- Existing landscape character and resources of the area (*Section 5.3*);
- Landscape policy and designations (*Section 5.4*);
- Zones of visual influence and viewpoints used in the assessment (*Section 5.5*);
- Landscape and visual impact mitigation (*Section 5.6*);
- Long term impacts on landscape resources and character (*Section 5.7*);
- Long term visual impacts (*Section 5.8*);
- Impacts during construction and maintenance (*Section 5.9*); and
- Limitations to this assessment (*Section 5.10*).

5.2 Methodology

5.2.1 Definitions and Methodology Employed

The assessment was undertaken in accordance with The Landscape Institute and Institute of Environmental Management and Assessment, *Guidelines for Landscape and Visual Impact Assessment: Second Edition, (2002).*

Key terms and definitions used in this assessment are stated below:

- Landscape value is the relative value or importance attached to a landscape (often as a basis for designation or recognition), which expresses national or local consensus, because of its quality, special features including perceptible aspects such as scenic beauty, tranquillity or wildness, cultural associations or other conservation issues.

- Landscape character is the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape and how this is perceived by people.
- Landscape quality (or condition) is based upon judgement about the physical state of the landscape and about its intactness from visual, functional and ecological perspectives. It also reflects the state of repair of individual features and elements which make up the character in any one place.
- Landscape capacity is the degree to which a particular landscape character type or area is able to accommodate change without unacceptable adverse effects on its character. Capacity varies according to the type and nature of the change being imposed.

The key steps in the methodology were as follows:

- To describe the landscape character areas and types present in the area;
- To identify significant landscape features that may be affected by the project;
- To identify key viewpoints and viewers likely to be affected by the project;
- To predict the effect of the project on landscape resources and character and on visual amenity;
- To evaluate the significance of these impacts; and
- To identify measures that will be taken to mitigate significant adverse impacts.

In particular:

- The area which corresponds broadly with the visual envelope (the zone of visual impact (ZVI)) of the development was surveyed and the results used to inform the assessment. Viewpoints representative of the range of viewing opportunities available in the ZVI were selected.
- The existing baseline character of the landscape was analysed and an assessment made of topographical structure, key vegetation, key forms of landscape importance (e.g. archaeological, ecological, water bodies), existing condition or quality, value (reflecting landscape designations), and capacity to accept development of the type and scale proposed.
- A desk study of scheme proposals, maps and other documents was undertaken to identify potential impacts on landscape character, landscape features and visual amenity of viewers during construction and operation of the development.
- 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.
- Options for mitigation of identified negative impacts of the development were also outlined and presented in a preliminary landscape design for the proposals.

The landscape and visual impact assessment was informed by data gathered from the following sources:

- Ordnance Survey maps;
- County Development Plans;
- Landscape Character Assessments for the area, where available;
- Field surveys;
- Air photographs;
- Computer generated theoretical ZVIs;
- Computer modelled photomontages; and

- Consultations with statutory bodies (Louth County Council).

A summary of comments made by the various consultees is included in *Appendix 1.3*.

5.2.2 ZVI Production

The ZVI maps the area within which a proposed development might have an influence or effect upon visual amenity, and is used as a tool to select sensitive points for more detailed assessment. A 20 kilometre radius ZVI, measured from the centre of the proposal was plotted. This technique is recommended in recognised guidance on visual impact assessment of tall structures.

In interpreting the ZVI's, two important issues must be considered:

- The ZVIs presented in this report are theoretical in that they do not take account of intervening vegetation, buildings or minor changes in topography, such as road cuttings. Where these features intervene between the viewer and the power station then this local visual screening will reduce the visibility of the project.
- The ZVI indicates where visibility might be possible anywhere within a 0.04ha grid square (i.e. this is its level of resolution) and it should not therefore be assumed that the power station will actually be seen at all points within each 0.04ha square.

ZVI maps for this project were produced as follows:

- All ZVI analysis was calculated using landform based on a digital terrain model derived from the Ordnance Survey of Ireland 20 metre DTM data.
- The resulting ZVI map was overlaid on OSI 1:50,000 mapping using ArcGIS.

5.2.3 Photomontage Production

Details of the photomontage methodology are set out below.

Site Photography, Panorama Stitching and Perspective

Photographs were taken by ERA Maptec with a full frame digital single lens reflex (SLR) camera and 50mm lens. A sequence of three frames in a panorama were taken at each viewpoint site. The individual frames had a 20 degree overlap. The exposure was kept constant for all three frames. Photographs were taken with and without the inclusion of three 2 metres high survey poles arranged in a triangular fashion. The positions of the camera and the survey poles were recorded using differential GPS (accurate to 0.5 metres). The exposure, view angle and weather conditions were also recorded for each viewpoint site.

For each viewpoint, ACD Photostitcher was used to combine the individual photographic frames into panoramas.

Matching computer-generated panoramas were constructed using the Visual Nature Studio programme. The parameters for these computer generated wireframes were based upon the recorded viewpoint and camera details. A perspective match was achieved between the computer-generated panoramas and the photographs by iteratively adjusting the perspective parameters (particularly viewcone and azimuth) until all major features in the image were aligned satisfactorily. The positions of the survey poles recorded in each frame were also modelled and these helped in matching the view. These panoramas showed the surrounding landform based on a digital terrain model derived from the Ordnance Survey of Ireland 20 metre DTM data. Where appropriate, objects in the landscape such as electricity pylons were used as additional markers.

Rendering and Output

Once accurate perspective parameters were known, these were fed into the rendering of Visual Nature Studio. A full model at the scale of the power plant was built within this package. Surface materials and colours were chosen to match those intended when the power plant is constructed. For each viewpoint, the date and approximate time of photography was used to calculate sun azimuth and elevation to ensure a correct lighting model. The final photomontages were composited using Adobe Photoshop.

In interpreting the photomontages, two important issues must be considered.

- There is an element of judgement inherent in the representation of changes shown in a photomontage. While the data sources are largely factual, or based on the judgement of professionals, the finished image is ultimately what ERA Maptec believes to be a reasonable imitation of a photograph of the completed proposal taken in similar conditions.
- Each photomontage incorporates the lighting seen in the base photograph. It therefore only truly represents the appearance of the proposed development as it would have appeared at that time on that day. The perceptibility of the changes and the visual character of elements of the scheme will be different under different weather or lighting conditions.

5.2.4 Prediction and Evaluation of Landscape and Visual Impacts

The assessment of landscape and visual impacts is based on three stages:

- Classification of the sensitivity of the landscape or visual receptors to the type of development proposed;
- Prediction of the magnitude of change in the landscape or the view of the site resulting from the development; and
- Evaluation of the significance of landscape and visual impacts depending on the sensitivity of the landscape or viewer to change and the magnitude of change.

Sensitivity of Landscape and Visual Receptors

The sensitivity of a landscape is judged based on the extent to which it can accept change of a particular type and scale without unacceptable adverse effects on its character. Sensitivity will vary according to the type of development proposed and the landscape's individual elements, key characteristics, inherent quality or condition, value, and capacity to accommodate change, and on specific values (such as designations) that apply.

The sensitivity of viewers depends upon the extent to which a visual receptor can accept change without unacceptable adverse effects upon the view. Viewer sensitivity depends on the location and context of the viewpoint, its importance, the current occupation and viewing opportunity of the people and groups of people being considered and the number of people affected. The duration of view, contrast with the existing view, angle of view, its openness/degree of obstruction by trees and buildings and the distance of the viewer from the proposed change all affect viewer sensitivity.

Sensitivity is described as *low*, *moderate* or *high* as defined in *Table 5.1* (landscape impacts) and *Table 5.2* (visual impacts).

Magnitude of Change

The magnitude of change affecting landscape or visual receptors depends on the nature, scale and duration of the particular change that is envisaged in the landscape, and in the location in which it is proposed, and the overall effect on a particular view. This may be very small if the development is at some distance. In a landscape, the magnitude of change will depend on the loss or change in any important feature or change in the backdrop to, or outlook from, a landscape that affects its character. The angle of view, duration of view, distance from the development, degree of contrast with the existing view and the extent of visibility all influence the magnitude of the change in view.

Magnitude of change is described as being *barely perceptible, low, moderate* or *high* as defined in *Tables 5.1* and *5.2*.

Significance of Impacts

Significance is determined by considering the sensitivity of the landscape or visual receptor and the magnitude of change expected as a result of the development. Each case is assessed on its own merits as significance is not absolute and factors unique to each circumstance need to be considered. However, the general principles underpinning the evaluation of significance are set out in *Tables 5.1* and *5.2* and these provide a guide to the application of professional judgement and experience in each individual case.

The significance of impacts is described as being *no impact, minor, moderate* or *major*.

Table 5.1: Levels of Significance of Landscape Impacts

			Magnitude of Change in Landscape caused by Proposed Development			
			Imperceptible	**Small**	**Medium**	**Large**
			An imperceptible, barely or rarely perceptible change in key landscape characteristics or components.	A small change in key landscape characteristics or components over a wide area or a moderate change either over a restricted area or infrequently perceived.	A moderate change in key landscape characteristics or components, frequent or continuous and over a wide area or a clearly evident change either over a restricted area or infrequently perceived.	A clearly evident and frequent/continuous change in key landscape characteristics or components affecting an extensive area.
Sensitivity of Landscape to Proposal	**Low**	A landscape which is not valued for its scenic quality or where its character, existing land use, pattern and scale are tolerant of the type of change envisaged, and the landscape has capacity to accommodate change.	*Not significant*	*Not significant*	*Minor*	Minor or moderate
	Medium	A moderately valued landscape, perhaps a locally important landscape, or where its character, land use, pattern and scale may have the capacity to accommodate a degree of the type of change envisaged.	*Not significant*	*Minor*	*Moderate*	Moderate or major
	High	A landscape protected by a regional (structure plan) or national designation and/ or widely acknowledged for its quality and value; a landscape with distinctive character and low capacity to accommodate the type of change envisaged.	Not significant	Minor or moderate	Moderate or major	Major

Table 5.2: Levels of Significance of Visual Impacts

			Magnitude of Change in View caused by Proposed Development			
			Imperceptible	**Small**	**Medium**	**Large**
			Change which is barely visible, such as at very long distances; or visible for a very short duration, perhaps at an oblique angle; or which blends with the existing view.	Minor changes in views, such as at long distances; or visible for a short duration, perhaps at an oblique angle; or which blends to an extent with the existing view.	Clearly perceptible changes in views such as at intermediate distances; resulting in a either a distinct new element in a significant part of the view; or a more wide ranging, less concentrated change across a wider area.	Major changes in view such as at close distances; affecting a substantial part of the view, continuously visible for a long duration; or obstructing a substantial part or important elements of view.
Sensitivity of Viewpoint	**Low**	Small numbers of visitors with interest in their surroundings. Viewers with a passing interest not specifically focussed on the landscape *e.g.* workers, commuters.	***Not significant***	***Not significant***	***Minor***	***Minor or moderate***
	Medium	Small numbers of residents and moderate numbers of visitors with an interest in their environment. Larger numbers of recreational travellers.	***Not significant***	***Minor***	***Moderate***	***Moderate or major***
	High	Larger numbers of viewers especially those with proprietary interest and prolonged viewing opportunities such as residents and users of attractive and well-used recreational facilities.	***Not significant***	***Minor or moderate***	***Moderate or major***	***Major***

5.3 Description of the Receiving Environment

The landscape character of Louth County and adjacent areas outside the County provides a significant contribution to its local identity and is a resource of value to future generations. The character of the site and its landscape context is described with reference to County or Regional Landscape Character Assessments).

A more detailed assessment of local landscape character was also undertaken by ERM and the results are presented in *Section 5.3.3*.

5.3.1 Development Site

The site proposed for the development is located in Louth County for which a Landscape Character Assessment has been undertaken and adopted in the County Development Plan 2003-2009 as amended July 2006. The proposal lies predominantly within the area covered by the County Landscape Character Assessment, specifically in the *'Louth Drumlin and Lake Areas'* Landscape Character Area. The key characteristics of this landscape character area as presented in the County Landscape Character Assessment are quoted below.

Key Characteristics:

- Southeast tip of the large drumlin areas extending into Connaught and Ulster.
- Typical landform of the drumlin glacial drift.
- Areas of biodiversity and ecological interest.
- Sparsely populated in comparison to the rest of the county.
- Strong sense of landscape enclosure created by the landform.
- Areas of scrub and rush invasion.
- Dominance of powerlines.

5.3.2 Neighbouring Areas

The *Louth Drumlin and Lake Areas* which includes the site is adjoined by the following character areas:

- Muirhevna Plain; and
- Lower Faughart, Castletown and Flurry River Basins.

Other landscape character areas located further afield (within an approximate 20 kilometre radius) include the following:

- in County Louth: Carlingford Lough Mountains including West Feede Uplands, Dundalk Bay Coast, Uplands of Collon and Monasterboice;
- in County Meath: North Meath Lakelands, North Navan Lowlands;
- in County Cavan in the absence of an available landscape character assessment, the area included within the study context includes the Kingscourt environs;

- in County Monaghan: In the absence of an available landscape character assessment, the area included within the study context includes the lake and drumlin landscapes of Castleblayney and Carrickmacross; and
- in County Armagh: *Crossmaglen Drumlins and Loughs, Ring of Gullio.*

5.3.3 The Local Landscape Character of the Site

To enable a closer look at the local landscape, the landscape of the site and its immediate environs is further characterised by ERM into three detailed Local Landscape Character Areas (LLCAs), shown on *Figure 5.1*:

- *Louth Lowland Farmland LLCA;*
- *Fane and Glyde Riverine and Wetland LLCA; and*
- *Carrickmacross Drumlins and Loughs LLCA.*

The landscape character of the site, and then each LLCA is described below. Each LLCA is also assessed for its sensitivity to the proposed change.

The Site

The various components of the development will be located in a vegetated, rural and largely undeveloped area. Geographically, the site is located 2-3 kilometres west of the town of Louth and lies in between the courses of two rivers. These are the River Fane which runs 3-4 kilometres to the north of the site and the River Glyde which runs 2-3 kilometres to the south.

The site for the proposed development lies in a large area comprising a mosaic of wet woodland, scrub and wet grassland. The proposed access to the site is located to the north and the landscape adjacent to this access comprises a series of large fields, used mostly for pasture. The field pattern is broadly geometric and the scale of the pattern is relatively large indicating that possible hedgerow removal has taken place in the past to facilitate more intensive agricultural practices. The field boundaries are defined usually by hedgerows and in some cases by dry stone walls. Some boundaries are usually defined by post and wire fencing. These features being man made and therefore reduce the rural quality and sense of wildness to the site and its immediate context.

The topography of the site and its immediate context is variable and features low glacially rounded ridgelines which assume a broadly east west orientation. Localised hollows between ridgelines are generally more damp in terms of soil conditions. In one of the more low lying areas, a mosaic of ecologically rich habitats comprising wet woodland, scrub and grassland is located. A small field drain occupies the south east boundary of the site and this runs in a west east direction.

One power line extends from the Monavallett electricity station located to the north east and crosses the landscape near the northern boundary of the site, together with the location for the proposed access road. A further two power lines cross the landscape adjacent to the south eastern corner of the site. These elements together with the pylon towers are visually dominant in this relatively visually exposed landscape. Long range views are available from the higher ground in the fields to the north of the site boundary. Views to the north are particularly scenic and include the low drumlin hills associated with the eastern part of Monaghan County and the Slieve Gullion environs, located almost directly north of the site.

The immediate site is judged to be of *high* landscape quality owing to the presence of valuable landscape and ecological resources contained therein.

The sensitivity of the site to the proposed development is *high*. This high value is derived from the presence of vegetation types which have a high landscape and ecological value. The high sensitivity is also derived from the visually exposed nature of the site within which tall structures are likely to be very conspicuous and are also likely to significantly undermine the rural character of the area as experienced by the viewer. The sensitivity of the site to the proposed access road is also judged to be *high* because of the presence of native species woodland which is a valued landscape and ecological resource.

Louth Lowland Farmland LLCA (including the site proposed for the power plant, described above)

The site is located within the Louth Lowland Farmland local landscape character area. The landscape here is rural in character and is relatively undeveloped. It is a generally open landscape comprising low lying gently undulating farmland. This LLCA includes the site for the proposed development which, topographically comprises a localised hollow.

Particular characteristics include the following:

- network of few regional roads (R171, R178 and R166) and many minor roads which assume a winding course around smaller watercourses and in-between low hills or ridgelines;
- towns are relatively compact and have little by way of suburban sprawl into the adjacent rural areas. These include Tallanstown, Louth and Knockbridge, all of which contain historic features including Mottes and churches. Some of these features have a strong visual presence and contribute positively to local landscape character;
- much of the land use is given over to agriculture including both pasture and tillage;
- hedgerows define the field boundaries generally and these tend to be cut or managed. Occasional large mature trees occur within these hedgerows;
- isolated clumps of mature woodland are present throughout this LLCA and apart from the wet woodland located within the development site, a further large and visually prominent stand of mature trees surround an existing property in the townland of Carrickadooan. To the south of the site an entire field contains a mosaic of woodland, scrub and grassland vegetation which shares similar characteristics with that located within the site boundary; and
- the electricity sub-station at Monavallet, south of Ballakelly Crossroads represents one of the largest and most prominent man made elements within this local landscape and together with large scale powerline infrastructure, it currently detracts from the scenic quality of this area and undermines the rural character overall.

The quality of the large farmed areas of this LLCA are assessed as being *low* owing to the adverse changes to the landscape caused by the intensification of farming practices which have eroded the landscape pattern and character generally. The presence of energy related infrastructure also serves as a major detractor which undermines scenic quality. The presence of powerlines, masts and pylons are also degrading factors for this landscape. The quality of particular pockets of landscape associated with native woodland and scrub areas together with villages and their sites of cultural and historic interest (for example the ruined church north of Louth town) are assessed as being of *medium* to *high* quality.

The sensitivity of this LLCA overall to the proposed development within it is judged to be *high* and this sensitivity is derived from the open nature of the landscape within which infrastructure comprising tall elements would generally dominate visually although the lower lying parts or localised hollows in this landscape offer some potential for partial screening of such development types. In addition this is a working landscape whose scenic quality is already compromised by the presence of degrading elements, for example, powerlines.

Fane and Glyde Riverine and Wetland LLCA

Located both north and south of the site proposed for the power plant are the river corridors of both the River Fane and the Glyde River. The key characteristics of this riverine LLCA are as follows:

- watercourses assume a sinuous course through low lying farmland;
- vegetation on the river margin varies greatly in quantity and diversity. Some stretches of the rivers are well wooded whilst others are visually exposed with improved pasture extending up to the river bank in many places; and
- both rivers have small tributaries and these are particularly abundant in the case of a particular section of the River Fane located to the north east of the site. This network of tributaries approaches the eastern part of the site.

The quality of this LLCA is assessed as being *high* in many places where the wetland river habitat is present and wooded vegetation is well established thereby enhancing the scenic quality of these rivers and their tributaries. The farmland located immediately outside of these watercourses comprises pasture or tillage and is assessed as being of a lower landscape quality than the river landscapes.

The sensitivity of this LLCA to the proposed development in the *Louth Lowland Farmland LLCA* is judged to be variable. The more elevated sections of the watercourses are assessed as being of *high* sensitivity where these are expected to be visually exposed to the proposed development. Some sections of these watercourses are assessed as being of *low* sensitivity to the proposed change because of their low elevation and the presence of woodland cover which makes these areas less exposed visually to the proposed development. The farmland located immediately outside these waterway corridors is expected to be more visually exposed to the proposals although it is of a lower landscape quality than the riverine landscapes and is assessed as having a *low* sensitivity to the proposed change.

Carrickmacross Drumlins and Loughs LLCA

This LLCA is located west of the site proposed for the power plant and contrasts with the LLCAs already described because of the variable topography including characteristically shaped drumlins and low smooth hills. The key characteristics are as follows:

- land cover comprises a mix of undulating farmland and farmed drumlin hills;
- frequent loughs are present and vary in size, some of which contain crannogs;
- clumps of mature deciduous woodland are present throughout this landscape;
- commercial coniferous forestry plantations are present and in some cases dominate visually owing to their large size;
- the scale of the field pattern is significantly smaller than that observed in the Louth Lowland Farmland LLCA and the boundaries are usually defined by hedgerows for which variable management regimes exist;

- pasture is the dominant landuse over tillage and occasional pockets of bog or marsh can be found in the inter drumlin hollows; and
- minor roads follow a sinuous course as a result of the varying topography.

This LLCA is judged to be of *moderate* to *high* quality and condition, but is degraded in particular locations by the presence of regularly shaped coniferous forests.

The sensitivity of this area to the development proposed in the *Louth Lowland Farmland LLCA* is variable. The more elevated locations, for example hilltops, albeit located at some distance from the proposed development are likely to be visually exposed and are thus assessed as being of *medium* sensitivity to the proposed change. The lower lying areas of this LLCA and wooded areas are assessed as being of *low* sensitivity to the proposed change.

5.4 Landscape Policy and Designations

Various landscape policies and designations relevant to landscape and visual issues are summarised below.

5.4.1 Policy

The County Landscape Character Assessment is referenced in the *Louth County Council Development Plan 2003 – 2009*, as being materially important in terms of heightening the awareness of landscape in all aspects of physical planning and for the purpose of guiding planners and others as to how landscape considerations should be dealt with. Policy 3.2 states *'it is the policy of the council to afford protection to the landscapes and natural environments of the county by permitting only those forms of development that are considered sustainable in rural areas and do not irreparably damage or unduly detract from the character of the landscape or natural environment.'*

In respect of tourism policy P 6.1, the County Plan sets out objectives for the natural environment including landscape of which the following strategic objectives are of relevance:

- 'maximise the potential of natural assets for the benefit of local people and visitors alike.'
- 'upgrade existing viewing points through the provision of facilities including, picnic facilities, seating and small scale information facilities.'

In respect of Recreation and Amenity Policies P 6.2, the following policies are of relevance:

- 'improve and extend the opportunities for the public to enjoy the countryside.'
- 'protect existing pedestrian links and walks. Where appropriate, to create new pedestrian access to public amenities and facilities, particularly to beach areas.'
- 'ensure that new developments do not impact negatively on either existing or proposed amenity or recreational facilities and designations.'

In regard to categories of protection afforded to Louth landscapes, the following objectives are stated in the development plan:

- 6.2.1 'It is the objective of the council to protect the unspoiled natural environment of **areas of outstanding natural beauty** for the benefit and enjoyment of current and future generations.'

- 6.2.2 ' It is the objective of the council to protect the unspoiled rural landscapes of **areas of high scenic quality** by limiting development to that required to sustain the existing rural communities that currently reside there.'

5.4.2 Designated Areas

Relevant landscape designations within 20 kilometres of the site are shown on *Figure 5.2*. Within Louth County, these are as follows:

- Area of Outstanding Natural Beauty associated with the mountainous and afforested landscape of Carlingford,
- Area of High Scenic Quality associated with the Cooley Peninsula and foothills to the south and west of Carlingford.
- Area of High Scenic Quality associated with the environs of Mount Oriel (north west of Collon).
- Views and prospects:
    - Vp 1 and V6 Mount Oriel;
    - Vp 6 Faughart Hill;
    - Vp 11 N2 North of Collon;
    - Vp 9 Tullydonnell;
    - Vp 12 Roche Castle;
    - Vp 14 Millickstown;
    - Vp 15 Bogberry Hill from the Schoolhouse;
    - Vp 21 Feede Mountain;
    - Vp 22 Views from Dungooley Crossroad;
    - Vp 23 Hackballscross view toward the mountains;
    - Vp 24 Killin Golf Club view towards the mountains;
    - V1 Old School Annagassan;
    - V9 Seabank; and
    - V10 Salterstown/
- Scenic Routes:
    - R178 Dundalk to Ballakelly Crossroads to Essexford;
    - R171 Dundalk to Knockbridge to Louth to Tallanstown and to Ardee; and
    - R166 Tallanstown to Annagassan.

Within Cavan County, Schedule 2 outlines Landscape and Amenity Areas as follows:

- Forest Parks:
    - P2 – Dunaree Forest Park, Kingscourt.

Within Monaghan County, these are as follows:

- Areas of Primary Amenity:
    - Lough Muckno and environs.

- Areas of Secondary Amenity:
    - Lisanisk Lake;
    - Lough Naglack; and
    - Rahans Lake.
- Views from Scenic Routes:
    - Scenic drive along Lough Muckno;
    - View of Slieve Gullion;
    - View of Lough Egish;
    - Views of Lough Muckno and Slieve Gullion; and
    - Scenic drive at Shantonagh.

Within Meath County, key viewpoints identified within the County Landscape Character Assessment that are located within the study area include the following:

- View from R162 to higher ground directly to North East; and
- Short range views of Whitewood Lough from road corridor and parking area including estate house above this lough.

Within Armagh County:

- Areas of Outstanding Natural Beauty:
    - Ring of Gullion.

5.5 Zones of Visual Influence and Viewpoints

A Zone of Visual Influence (ZVI) was produced by ERA Maptec showing the extent of theoretical visibility of the proposals within a 20 kilometre radius. This is presented in *Figure 5.3*. This theoretical ZVI does not take into account screening by buildings and vegetation. In practice many views towards the site will be filtered or screened by existing deciduous woodland in the valleys, forests on the hillsides and by intervening structures.

Beyond 20 kilometres, elevated locations such as hills and mountains will provide additional elevated, longer distance views on clear days. On days when visibility is poor or the cloud base is below the level of the proposed development, or below the level of the viewer, there will be limited or no views.

Within the theoretical ZVIs there are a number of different types of locations from which people may see the site. These are listed in *Table 5.3*.

Table 5.3: Theoretical ZVI

Principal settlements		
• Dundalk • Ardee • Carrickmacross • Kingscourt	• Dunleer • Castlebellingham • Tallanstown • Louth	• Crossmaglen • Drumcondra • Knockbridge • Forkill
Main roads		
• N2 National Primary Route • N52 between Ardee and Dundalk	• N53 west of Dundalk • R171 road route • R178 road route	• R 165 road route • R179 road route • N1 road route from Dundalk extending southward.
Main hills and hill groups or ranges		
• Slieve Gullion • Slieve Shean • Black Mountain and associated foothills.	• Drumlin Hill range located north and north west of Carrickmacross and Kingscourt.	• Faughart Hill • Mount Oriel

Taking these locations and tourist attractions in the area into account, 61 viewpoints were selected to represent the main areas from which the development may be seen and the different types of viewing opportunity these offer (residential, passers by, *etc*). Their locations are shown on *Figure 5.4.*

Five of the 61 were selected for further illustration and photomontages were prepared for these locations. The viewpoints are listed in *Table 5.4* with an indication of their distance from the site, the type and number of viewers and their resulting sensitivity.

5.6 Landscape and Visual Impact Mitigation

In assessing the impact of the proposals on the landscape and visual environment, account was taken of various measures that will be taken to mitigate these impacts through design, construction and other means. These were developed through preliminary analyses undertaken to identify the expected impacts of the proposed development in the absence of mitigation. From this, mitigation measures to help reduce impacts were developed and agreed. The assessment of impacts takes into account implementation of these mitigation measures described below.

5.6.1 Embedded Mitigation Measures

Elements of the design were developed through preliminary landscape impact analysis, identifying the expected impacts of the proposed development in the absence of mitigation and proposing changes to the layout of the scheme and the appearance of the proposed structures to mitigate these impacts. Key embedded mitigation measures integrated into the final layout include:

- Landscape character and visual amenity issues were considered in the design process. Input was provided during the development of the design and this was specifically concerned with the layout or positioning of the stack (the tallest of the proposed structures). A more easterly location was favoured for this in the interest of visual amenity for residents of dwellings located near to the site, many of which are located to the south and west of the site;

- The materials, finishes and colours for the proposed structures were selected to favour the reduction of potential visual impact. Non reflective finishes will be used in order to reduce or avoid impacts relating to sunlight reflection or glare which could be experienced by the viewer. The finished colour of the stack will be designed to favour the reduction of potential visual impacts as with the other buildings and structures;
- Access roads will be designed to follow and fit with contours in the landscape in order to minimise the required earthworks (cut and fill);
- Signage will be provided only for health and safety purposes or will be agreed with Louth County Council;
- There will be minimal external lighting (restricted to that required for health and safety purposes); and
- Replacement landscape treatment comprising native species will be introduced to compensate in part for the loss of existing vegetation as a result of the scheme and to mitigate in part predicted visual impacts. The landscape mitigation proposals are illustrated in *Figures 5.5a* and *5.5b* and a schedule of proposed plant species for each of the proposed mixes is scheduled in *Table 5.4* at the end of this chapter.

5.6.2 Additional Measures to Mitigate Landscape and Visual Impact

A post construction restoration plan will be prepared to guide on the appropriate restoration of landscape earthworks, soils and vegetation once the construction phase is complete.

5.6.3 Measures to Mitigate Impacts During Construction

Further measures will be applied during construction to mitigate short term impacts. In this regard, a detailed Construction Environmental Management Plan (CEMP) will include arrangements for design and implementation of various aspects of the works including turf and soil removal, storage and replacement, felling and woodland planting, watercourse crossings, and measures to protect landscape resources will be integrated into these prior to construction. Measures that will be taken to mitigate landscape and visual impacts during construction will include:

- design to minimise land take;
- design to minimise tree and other vegetation removal;
- protection of valued features, such as wetland, woodland and scrub, heath and other habitats to be retained using fencing. Measures used to protect existing vegetation to be retained will comply with that set out in BS 5837, Trees in Relation to Construction.
- restricting construction lighting outside normal working hours to the minimum required for public safety and security;
- maintenance of tidy and contained site compounds;
- restricting the evacuation of construction dust into the atmosphere by means of regular applications of water to the site.
- 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.

In regard to site access, tracks will be constructed first and movement of vehicles will not be permitted outside of these roads, so that the farmed landscape is left undisturbed as far as possible, and that soil compaction does not result from vehicles tracking over farmland generally. Where access tracks pass through field boundaries, gates or cattle grids will be provided. Drystone walls will be avoided as far as possible, but if any are breached the stonework on either side of the crossing will be reconstructed up to the edge of the track.

5.6.4 Long Term Management Measures

Site Management Plan

It is recommended that a long term management plan be developed in consultation with the NPWS 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.

Monitoring

It is recommended that monitoring of the construction phase be undertaken by appropriate environmental staff to monitor compliance with landscape and ecological and other requirements.

5.7 Long Term Impacts on Landscape Resources and Character

5.7.1 Sources of Impact on the Landscape and Direct Impacts on the Site

The development will result in the following physical and direct adverse changes in the landscape.

- The proposals will result in the permanent loss of an area of undeveloped land located in the townland of Toomes;
- The landscape or specifically the land area that will be permanently removed currently supports a diverse range of vegetation types which in turn represent habitats of significant landscape and ecological value;
- Hedgerow vegetation will be removed including the following:
    - hedgerow vegetation located along the line of the proposed access road to the north of the site; and
    - a section of a hedgerow (located at right angles to the northern boundary of the site.
- An elongated area of mixed broadleaf woodland located on the north western corner of the site which extends in part into the site on the western side and along the northern boundary will be felled;
- An elongated area of mixed broadleaf woodland located on the north eastern boundary of the site will be felled;
- A large area of wet mixed species woodland, comprising willow, alder and ash located on the western side of the site will be felled together with a smaller area of similar species content on the eastern side of the site;
- A substantial area of the site comprising a mosaic of scrub, dense bracken and wet grassland will be felled;

- Sections of stone walling combined with earth banks will be removed. These will be affected in three locations:
    - along the length of the access road;
    - along the northern boundary of the site adjacent to the broadleaf woodland; and
    - a small section associated with the hedgerow boundary located at right angles to the northern boundary of the site.
- The structures associated with the power plant will add man made elements of considerable scale to the landscape, in particular the proposed stack, gas and steam turbine hall, heat recovery steam generator and air cooled condenser. These will become a new identifiable landmark and a point of reference in views from the wider area. All of the proposed structures will permanently displace a vegetated area;
- There will be a 2.3 kilometre network of 8 metre wide roads through the site. These will be completely new features. A section of the roadside hedgerow on the local road to the north of the site will be removed to facilitate the proposed site access.

Impacts on the surrounding local landscape character areas derived by ERM may be *direct* and *adverse*, (hereinafter reported as *direct*) which means that the proposals will result in direct or physical changes of an adverse nature to the receiving landscape. Impacts may also be *indirect* and *adverse*, (from here on reported as *indirect*) these indirect adverse effects being concerned with the impact that the proposals will have on the setting of a particular landscape as perceived by the viewer. Indirect impacts are inextricably linked with views. The impact of the proposals on the LLCAs is discussed below.

Louth Lowland Farmland LLCA (including the site proposed for the power station)

The *Louth Lowland Farmland* landscape including and immediately surrounding the site is assessed as being of *high* sensitivity to the development (see *Section 5.3.3*). The development described above will result in direct changes to part of this LLCA of a *large* magnitude as outlined above and therefore have a *major* impact upon the landscape. Outside of the site proposed for the development, *indirect* changes will occur to this LLCA as a result of the visibility of the proposals and these are assessed to cause a *large* magnitude of change in these areas of *high* landscape sensitivity therefore resulting in an indirect impact of *major* significance.

Farm and Glyde Riverine and Wetland LLCA

The proposed power plant lies outside this character area and will have an *indirect* impact as a result of its visibility. The elevated sections of these rivers are likely to be generally visually exposed to the proposed power plant and thus it is assessed to cause a *medium* magnitude of change in these areas of *high* landscape sensitivity, therefore resulting in an indirect impact of *moderate to major* significance.

The low lying and wooded nature of some sections of these rivers means that the power plant is generally unlikely to be seen from the majority of these locations. Thus it is assessed to cause a *small* magnitude of change in this area of *low* landscape sensitivity, therefore resulting in an indirect impact of *no* significance.

The farmland adjacent to the river corridors is likely to be generally visually exposed to the proposed power plant and this is assessed to cause a *medium* magnitude of change in this area of *low* landscape sensitivity, therefore resulting in an indirect impact of *minor* significance.

Carrickmacross Drumlins and Loughs LCA

Impacts upon landscape character in this LLCA will also be *indirect* and will be derived from the predicted visibility of the power plant from this LLCA.

The proposed power station is expected to be visible generally from hilltop locations albeit at some distance. These elevated parts of this LLCA are assessed as being of *medium sensitivity* to the proposed change. The proposed power station is assessed to cause a *small – medium* magnitude of change therefore resulting in an impact of *minor – moderate* significance.

The lower lying parts of this landscape, namely the inter drumlin hollows, are expected to be generally screened from view of the proposals by intervening topography. These areas are thus assessed as being of *low* sensitivity to change. The proposed power plant is assessed to cause an *imperceptible* change in these areas of *low* landscape sensitivity, thereby resulting in an impact of *no* significance.

5.7.2 Landscape Impacts in the Wider Area

The proposed power plant will be theoretically visible from many locations including the LLCAs referred to above. Outside of these LLCAs the proposed power station is expected to be visible only from particular elevated locations. There are many landscapes or areas located at lower elevations which will be unaffected. These include sections of the corridors associated with the Rivers Dee, Castletown and Flurry together with sections of the Rivers Fane and Glyde.

Slieve Gullion and the mountain range located in Carlingford are prominent, locally dominant mountain ranges whose height and mass is enhanced by their juxtaposition with the low lying farmed landscapes of County Louth. These upland areas form the backdrop and setting, and contrast with the farmed and river corridor landscapes of County Louth. They are viewed across the lowlands from a southerly direction at considerable distances (up to at least 30 kilometres from the south) and can appear of greater height and mass than they really are, particularly in certain light conditions. The proposed structures are predicted to intrude upon the views of the upland areas from a range of locations within the ZVI. Hence indirect impacts of an adverse nature will apply to the character of the upland landscapes as experienced by viewers in these locations. These indirect effects will be more pronounced in clear weather conditions when visibility is enhanced.

The impacts on the character of the landscape in the wider area outside of the LLCAs referred to above is discussed in the context of the landscape character areas for each county referred to in *Section 5.3.2*.

Co. Louth

The proposed power plant will have indirect impacts on many of the landscape character areas located in Louth County. The most affected areas will be the *Louth Drumlin and Lake Areas* and *Muirhevna Plain,* where the ZVI shows that the proposals will be visible from many locations. The presence of vegetation cover is such that the range of locations from which the proposals will actually be visible is likely to be less than illustrated in the ZVI. Where views of the power plant are obtained, impacts on landscape character will result through a reduction in rural character. The proposed power plant is assessed to give rise to a *small* magnitude of change in these areas of *low* landscape sensitivity therefore resulting in an indirect impact of *minor* significance.

Other landscape character areas affected include *Carlingford Lough and Mountains, Dundalk Bay Coast* and *Uplands of Collon and Monasterboice*, where the ZVI shows that the proposals will be visible from particular geographic areas within these character areas. According to the ZVI, the main areas affected in the *Carlingford Lough and Mountains* area include the foothills to Black Mountain and Faughart Hill. In the *Dundalk Bay Coast* area, the lowland and coast (including coastline and ocean) located south of the suburb of Blackrock will be mainly affected. In the *Uplands of Collon and Monasterboice*, the main areas which will be affected include rural areas located south of the town of Ardee. In the case of all the landscape character areas, the actual visibility of the proposals is likely to be less than that illustrated in the ZVI, owing to the presence of intervening vegetation screens. Where views of the power plant are obtained, impacts on landscape character will result through a reduction in rural character. The proposed power station is assessed to cause a *small to imperceptible* magnitude of change in these areas of *low* landscape sensitivity, therefore resulting in an indirect impact that is *not significant*.

In the case of *Lower Faughart, Castletown and Flurry River Basins* Landscape character area, the ZVI shows that a very small proportion of this landscape will be affected. The impacts are confined largely to a part of Dundalk Harbour and bay and small areas located in the north west near the county boundary. The presence of vegetation cover is such that the range of locations from which the proposals will actually be visible is likely to be less than illustrated in the ZVI. The proposed power station is assessed to cause an *imperceptible* magnitude of change in these areas of *low* landscape sensitivity, therefore resulting in an indirect impact that is *not significant*.

Counties Cavan and Monaghan

The proposed power plant will have indirect impacts on the landscapes of these counties within the study area. The ZVI shows that the proposals will be visible from the tops of the drumlin hills throughout. The presence of vegetation cover is such that the range of locations from which the proposals will actually be visible is likely to be less than illustrated in the ZVI. The proposed power station is assessed to cause an *imperceptible* magnitude of change in these areas of *low* landscape sensitivity therefore resulting in an indirect impact that is *not significant*.

County Armagh

The proposed power station will have indirect impacts on both the *Crossable Drumlins and Loughs and* the *Ring of Gullion* landscape character areas. The ZVI shows that the proposals will be visible from rural locations to the south and east of Crossmaglen in the former landscape character area and the summit of Slieve Gullion and foothills in the latter. The presence of vegetation cover is such that the range of locations from which the proposals will actually be visible is likely to be less than illustrated in the ZVI. The proposed power plant is assessed to cause an *imperceptible* magnitude of change in these areas of *low* landscape sensitivity therefore resulting in an indirect impact that is *not significant*.

County Meath

The proposed power plant will have indirect impacts on both the *North Meath Lakelands and the North Navan Lowlands* landscape character areas. The ZVI shows that the proposals will be visible from particular elevated locations, namely two ridgelines located west of Ballyhoe Lough in the North Meath Lakelands and the tops of many small hills throughout the *North Navan Lowlands.* The presence of vegetation cover is such that the range of locations from which the proposals will actually be visible is likely to be less than illustrated in the ZVI. The proposed power station is assessed to cause an *imperceptible* magnitude of change in these areas of *low* landscape sensitivity, therefore resulting in an indirect impact that is *not significant*.

5.7.3 Impacts on the Landscape Setting of Designated Landscapes

The power station will be visible from some of the designated landscapes and locations that afford designated views as listed in 5.4.2 above.

There will be no *direct* impacts on the designated landscapes. The power station will be visible from some of the designated areas and from some of the locations from which designated views are available thus constituting an indirect impact on the setting of these landscapes. These impacts are outlined below.

Co. Louth

According to the ZVI, the proposals are expected to be visible from selected locations within the designated landscapes in north Louth. These include *the mountainous and afforested landscape of Carlingford* AONB (visited at viewpoints 57, 58 and 59). The proposed structures, where actually visible, are likely to be almost imperceptible, resulting in a *not significant* impact on the setting of these landscapes.

Theoretical views of the proposals as illustrated in *Figure 5.4* will be gained from the *Cooley Peninsula* Area of High Scenic Quality the *Mount Oriel* Area of High Scenic Quality. The proposed structures where actually visible are likely to be almost imperceptible, resulting in a *not significant* impact on the setting of these landscapes.

Theoretical views of the proposals will be gained from some of the designated viewpoints listed in *Section 5.4.2*. In some cases, where actual views may be gained, the proposals will be scarcely visible or imperceptible resulting in a *not significant* impact. This applies to viewpoints VP1 and V6 Mount Oriel, VP 9 Tullydonnell, VP 14 Millickstown, VP 21 Feede Mountain and V10 Salterstown.

In the case of VP 6 Faughart Hill, this site was visited and actual views of the proposals are predicted to be almost imperceptible from this panoramic view location in a westerly direction. The impact significance is assessed as being *not significant* and further detail is given in *Table 5.4, Vp 51*.

In the case of VP 12 Roche Castle, views of the proposals will not be available from the castle site itself; however the proposed stack is theoretically visible from the hill located to the east of the castle site, thereby affecting the setting of the castle as experienced by viewers on the hill. The impact significance is assessed as being *minor to not significant.*

Viewpoints which are assessed as being unaffected by the proposals include the following:

- Vp 11 N2 North of Collon;
- VP 15 Bogberry Hill from the schoolhouse;
- Vp 22 Views from Dungooley Crossroad;
- Vp 23 Hackballscross view toward the mountains;
- Vp 24 Killin Golf Club view towards the mountains;
- V1 Old School Annagassan; and
- V9 Seabank.

Indirect impacts on the designated scenic routes will arise. Drivers travelling in a westerly direction on the R178 Dundalk to Ballakelly road route, specifically from Thomastown will have many opportunities to view the proposals. Similarly drivers using the R171 Dundalk to Ardee road route will be affected. Those travelling east between Littlemill and Louth and those travelling north from Ardee to Louth will have many opportunities to view the proposals. Where these routes cross the Rivers Fane and Glyde, views of the proposals will not be gained. The R166 Tallanstown to Annagassan will also be affected by the proposals. Drivers travelling east from the junction of the N52 to Tallanstown will have many opportunities to view the proposals. Drivers travelling east from Annagassan to the N52 junction are likely to have less opportunity to view the proposals, in particular where this road route follows closely the course of the Glyde River.

County Cavan

The designated landscape of Dunaree Forest Park will be largely unaffected by the proposals although further east views of the proposals are theoretically available from the summit of the drumlin hill located to the east thereby affecting the viewers appreciation of the large woodland area associated with the forest park. The impact is assessed as being *not significant.*

County Monaghan

The Lough Muckno and environs Area of Primary Amenity will be affected by the proposals. Views of the proposals will not be gained by users of the lake; however the very summits of some of the drumlin hills surrounding the lake will command views of the proposals as shown in the ZVI illustrated in *Figure 5.3.* Where actual views of the proposals are available from these hilltops, the impact significance is expected to be not significant.

The lakes as Areas of Secondary Amenity and the scenic routes identified in *Section 5.4.2* will not be affected by the proposals.

County Armagh

The proposals are expected to be visible from the upper portions of Slieve Gullion which is associated with the *Ring of Gullion* AONB, specifically above the line of the forestry plantation on this mountain. The proposed structures where visible are likely to be imperceptible resulting in a *not significant* impact on the setting of these landscapes.

County Meath

The scheduled views identified in *Section 5.4.2* will not be affected by the proposals.

5.8 Long-term Visual Impacts

5.8.1 Potential Receptors

The introduction of new structures and activity around the site will have adverse impacts upon the quality of views experienced by people living, working or visiting in the surrounding area. These effects, in some cases, are predicted to be perceived as prominent, intrusive and unsightly. *Figure 5.4* identifies viewpoints selected to represent the range of places from which people may see the development, from different types of location, distances and directions.

The adverse impact on each of these was assessed taking into account the sensitivity of the viewpoint, the magnitude of change in the view and the resulting significance of impact. The results are presented in *Table 5.4*. The viewpoints are described in terms of their elevation, distance from the site and viewer type and number. The existing view towards the site is described and an assessment made of the predicted change in view that is expected to occur with the development proposals in place. The sensitivity of each viewpoint and the magnitude of change are identified and the significance of resulting impact defined.

The assessment was assisted by the preparation of photomontage images of the development for five viewpoint locations.

It must be appreciated that photomontages by their nature give a restricted and artificial view, and the real effect can only be seen by experiencing the view in person. The illustrations do not therefore provide an exact replication of future views, but the proposals are shown to scale to give an idea of the size of the structures and their effect on the view. In assessing visual impacts, consideration is given to the effect of light and weather conditions on visibility, and the variation in the view around the exact position of the photograph.

5.8.2 Results

The assessment indicates that there will be *major* adverse impacts from viewpoints located within at least a kilometre of the proposals many of which represent residents of dwellings. Some viewers will experience partial views of the proposals. In these examples, some screening by intervening local topography or buildings is predicted to arise resulting in an impact of *moderate-major* significance. Visual impacts of a *minor - moderate* or a *minor* significance are predicted to occur at viewpoints located close to the proposals where vegetation or other existing structures are present and provide partial screening of the proposals. At distances of 7 kilometres and further the proposals, where visible, are expected to be seen as very small or imperceptible elements in the skyline resulting in a *not significant* adverse visual impact.

In general, elements of the proposals located at or near ground level (within the development site) are expected to be screened from view from many locations by the local topography and as a result of the immediate site location, being placed in a localised hollow. The local topography will therefore mitigate, in part some of the visual impacts that could arise from structures of low or no height including administration buildings, boilers, access and internal roads and construction laydown areas.

The larger elements of the proposals which are expected to be visible at a range of distances include the stack (and potential emissions from time to time), the HRSG, the air cooled condenser, the turbine building and the storage tanks. These are expected to intrude upon existing views thereby causing a general reduction in rural farmland landscape character at a local level as perceived by the viewer from particular locations.

In the case of viewpoints representing viewing opportunities towards the north, the proposals are likely to intrude upon particularly scenic views of the Cooley Mountains. This predicted intrusion upon an existing view has a particular local significance because of the unique mountain backdrop. By contrast viewpoints located to the north east of the proposals represent in part viewers whose current view of the wider rural farmland is adversely affected by the existing ESB station at Monavallett and hence views of the proposed power plant will be gained in the context of existing infrastructure of a significant scale.

Further afield for distances of between 3-5 kilometres from the proposals the visual impact of the bulk or mass of the power station buildings is expected to be significantly reduced and in some locations these elements will be screened from view by intervening vegetation and buildings. The stack continues to be a clearly visible element from many of the viewpoint locations assessed and it is likely to be present as a clearly distinguishable element in the wider farmed skyline.

At 5 to 10 kilometres distance from the proposals and beyond, views of the proposed power station will be restricted by intervening undulating topography. This area represents the more low lying river landscapes associated with the River Dee to the south, the Garra River to the south west and the Castletown River to the north. In addition, river valley landscapes associated with sections of the Rivers Fane and Glyde are of a sufficiently low elevation topographically to be screened from view of the proposals by intervening topography. The presence of riverside vegetation in many locations serves to provide further screening from the proposals.

At a distance of approximately 10 to 20 kilometres from the proposals the stack is expected to be the main visible element, although this will be present as a very small element in the wider skyline. In some weather conditions it may be scarcely visible or not visible at all. The locations where these views may be gained as illustrated in the ZVI are scheduled below:

- the hills to the north east of Dundalk including Faughart Hill where the proposals will be seen against the Dundalk urban area in the foreground;
- Black mountain and foothills in the Carlingford area;
- Slieve Gullion;
- Dundalk harbour area and parts of the town where it is expected that the upper floors of tall buildings located on the western edge will afford views of the proposals;
- Dundalk Bay subject to the limitations of the built up area;
- the towns of Ardee, Castlebellingham and Dunleer will be affected in part only owing to their low elevation, being located in river valleys (River Dee, River Glyde and White River respectively);
- the town of Kingscourt will be affected although the area extent from which views of the proposals will actually be gained will be less than that illustrated in the ZVI due to the screening effect of the woodland associated with Dunaree Forest Park;
- rolling farmland landscape directly south of Ardee; and

- the summits of the drumlin hills in Counties Monaghan and Cavan located to the west.

Refer to *Table 5.4* and *Figures 5.6 a* to *e* for photomontage images results.

Table 5.4: Assessment of Visual Impacts at Selected Viewpoints

Grid Ref Easting	Grid Ref Northing	Elevation in Metres	Distance to Site in metres	Illustrated viewpoint	Description Of viewpoint	Components in existing view	Proposed view	Viewer type & number	Viewer Sensitivity	Magnitude of change	Significance of imapct
293328	301887	39.94	326.72	1	Two Storey Dwelling	Maturing birch woodland located within site proposed for power plant	Short range views of the proposals particularly the chimney stack and upper portions of some of the proposed buildings including the HSRG and turbine hall are likely to be gained	H Few	High	Large	Major
293297	301787	39.67	404.19	2	Bungalow dwelling	Local road and rolling farmland.	Short range views of the proposals particularly the chimney stack and upper portions of some of the proposed buildings including the HSRG and Turbine hall are likely to be gained.	H Few	High	Large	Major
293231	301837	40.57	377.55	3	Bungalow dwelling	Farmland with woodland in foreground. Ridgeline visible in short range. Cooley Mountains in far distance.	Short range views of the proposals particularly the chimney stack and upper portions of some of the proposed buildings including the HSRG and Turbine hall are likely to be gained.	H Few	High	Large	Major
293056	301854	43.86	445.49	4	Two storey dwelling	Rolling farmland and ridgeline in foreground. Cooley mountains in distance.	Short range views of the proposals particularly the chimney stack and upper portions of some of the proposed buildings including the HSRG and Turbine hall are likely to be gained.	H Few	High	Large	Major
292916	301853	46.09	523.06	5	Single storey long cottage dwelling	Farmed pasture in foreground. Cooley Mountains in far distance.	Short range views of the proposals particularly the chimney stack and upper portions of some of the proposed buildings including the HSRG and Turbine hall are likely to be gained	H Few	High	Large	Major
292804	301882	48.33	623.21	6	Group of dwellings and farm	Farmland, local road, hedgerow and wooded vegetation	Short range views of the proposals including the chimney stack and upper portions of power plant buildings are likely to be gained filtered through some vegetation.	H Few	High	Large	Major
292652	301902	51.638	695.95	7	Group of dwellings	Local road and roadside hedgerows. Second storey level affords views of wider farmland.	Views of the proposals are likely to be clearly gained from the second storey windows of this dwelling and will include the proposed chimney stack and the upper portions of some of the buildings	H Few	High	Large	Major
292596	301927	50.82	759.78	8	Bungalow Dwelling	Boundary wall visible from immediate location of house. Wider farmland visible from field gate at driveway entrance.	Views (at the field gate beside the dwelling driveway entry) of the proposals are likely to be gained at short range. The chimney stack and the upper portions of the proposed HSRG and turbine hall are predicted to be visible	H Few	High	Large	Major
293208	301431	43.95	791.47	9	Bungalow Dwelling	Local road and roadside hedgerow. Farmland. Cooley Mountains in far distance.	Views of the proposals are likely to be gained at short range above the line of the roadside hedgerow. The chimney stack and	H Few	High	Large	Major

Grid Ref Easting	Grid Ref Northing	Elevation in Metres	Distance to Site in metres	Illustrated viewpoint	Description Of viewpoint	Components in existing view	Proposed view	Viewer type & number	Viewer Sensitivity	Magnitude of change	Significance of imapct
							the upper portions of the proposed HSRG and turbine hall are predicted to be visible.				
292657	301308	42.30	1148.54	10	Two storey dwelling	Farmland filtered through some woody vegetation	At least the proposed chimney stack is predicted to be visible filtered through some vegetation in the foreground.	H Few	High	Large	Major
292289	301348	37.67	1315.86	11	Group of dwellings	Local road, pastureland and hedgerows	At least the proposed chimney stack is predicted to be visible above the line of the localised ridgeline in the foreground.	H Few	High	Large	Major
292175	301382	38.22	1435.26	12	Group of dwellings	Hedgerows in immediate foreground	Views of the proposals are likely to be gained filtered through existing vegetation in wintertime.	H Few	Moderate-High	Medium-Large	Moderate-major
293369	301535	39.89	677.90	13	Two Bungalow dwellings	Local road, farmland, woodland and scrub vegetation.	Short range views of the proposed chimney stack will be gained in part above the line of existing vegetation. Short range views will also be gained of particular buildings located near to the chimney, in particular the HSRG and the turbine hall. The visibility of the proposals is expected to increase in wintertime owing to leaf loss.	H Few	High	Large	Major
293461	301544	39.46	681.55	14	Group of dwellings	Local road, farmland, woodland and scrub vegetation. Power line infrastructure.	Short range views of the proposed chimney stack will be gained above the level of the existing vegetation in the foreground. In wintertime other elements of the proposals may be visible as a result of leaf loss.	H Few	High	Large	Major
293603	301551	40.11	704.01	15	Bungalow dwelling	Local road, farmland, woodland and scrub vegetation. Power line infrastructure	Short range views of the proposed chimney stack and the upper portions of some of the power plant buildings will be gained.	H Few	High	Large	Major
293684	301562	41.08	756.04	16	Bungalow dwelling	Local road. Farmland including ridgeline in foreground. Power line infrastructure	Short range views of the proposed chimney stack and the upper portions of some of the power plant buildings will be gained in part above the crest of a localised ridgeline.	H Few	High	Large	Major
294243	301508	38.69	1238.65	17	Two storey dwelling and farm	Rolling farmland and hedgerows. Local ridgeline	Short range views of the proposed chimney stack and the upper portions of some of the power plant buildings will be gained in part above the crest of a localised ridgeline.	H Few	High	Large	Major
294471	301469	36.56	1378.44	18	Group of farm buildings. Dwelling likely to be present	Woody vegetation in the curtilage. Farmland in further distance.	Short range views of the proposed chimney stack and the upper portions of some of the power plant buildings will be gained in part above the crest of a localised ridgeline.	H Few	High	Large	Major
294866	301545	35.49	1702.20	19	Bungalow dwelling	Local road and roadside hedgerow	Short range views of the proposed chimney stack and the upper portions of some of the power plant buildings will be gained in part above the crest of a localised ridgeline.	H Few	High	Large	Major
294732	301802	41.81	1513.28	20	Dwelling house	Conifer boundary hedge (on boundary with road).	Views of the proposals are predicted to be screened by coniferous hedging in the immediate foreground.	H Few	Low	Not Perceptible	Not significant

Grid Ref Easting	Grid Ref Northing	Elevation in Metres	Distance to Site in metres	Illustrated viewpoint	Description Of viewpoint	Components in existing view	Proposed view	Viewer type & number	Viewer Sensitivity	Magnitude of change	Significance of imapct
294087	302457	38.31	826.91	21	Bungalow dwelling	Farm building within curtilage of property.	Views of the proposals are predicted to be screened by farm buildings in the immediate foreground.	H Few	Low	Not Perceptible	Not significant
293798	303106	35.00	1024.61	22	Bungalow dwelling	Petrol station and yard with stockpiles of gravel in foreground. Farmland in background.	The proposals, in particular the proposed chimney is likely to be visible at short range above the roofline of the petrol station building in the foreground. The sensitivity of the viewer is judged to be relatively low at this location given the poor quality of the existing view thereby resulting in a reduced significance of impact.	H Few	Medium	Large	Moderate-Major
293885	303125	38.88	1060.42	23	Group of dwellings	Petrol station and yard with stockpiles of gravel in foreground. Farmland in background	The proposals are likely to be clearly visible at short range in part above the ridgeline in the foreground, in particular the chimney stack, the HSRG and the Turbine Hall	H Few	High	Large	Major
293929	303146	40.71	1129.36	24	Group of dwelling	Road and rolling countryside. Prominent ridgeline	The proposed chimney stack is likely to be clearly visible at short range above the roofline of an existing building in the foreground. Much of the proposals are likely to be screened from view by vegetation and buildings in the foreground.	H Few	High	Large	Major
293596	303061	37.91	895.55	25	Two storey dwelling	Local road and roadside hedgerow.	The proposals are likely to be visible at short range in part above the level of the existing road side hedgerow, in particular the chimney stack, the HSRG and the Turbine Hall. The proposed site entrance is unlikely to be visible owing to a ridgeline or 'hill' in the local road to the west.	H Few	High	Large	Major
293375	303008	40.64	809.11	26	Bungalow dwelling	Local road and roadside hedgerow	The proposals are likely to be visible at short range in part above the level of the existing road side hedgerow, in particular the chimney stack, the HSRG and the Turbine Hall. The proposed site entrance is unlikely to be visible owing to a ridgeline or 'hill' in the local road to the west	H Few	High	Large	Major
293001	302907	40.03	752.89	27	Group of dwellings	Fenced farmland and hedgerow vegetation beyond	The proposals are predicted to be visible, in particular the chimney stack and upper portions of the taller buildings (HSRG and Turbine Hall) at short range above the level of a low cut hedgerow in the foreground	H Few	High	Large	Major
292938	302865	40.01	732.65	28	Dwelling	Farmland. Hedgerows and farm building	Views of the proposals will be screened in part by a farm building in the immediate foreground. Parts of the proposals are predicted to be visible at very short range including the chimney stack and upper portions of the power plant buildings.	H Few	High	Large	Major
292700	302817	39.24	875.70	29	Two 2 storey dwelling	Farmland and hedgerows with some mature trees	The proposed chimney is predicted to be clearly visible together with the upper	H Few	High	Medium-large	Moderate-major

Grid Ref Easting	Grid Ref Northing	Elevation in Metres	Distance to Site in metres	Illustrated viewpoint	Description Of viewpoint	Components in existing view	Proposed view	Viewer type & number	Viewer Sensitivity	Magnitude of change	Significance of imapct
							portions of parts of the power plant buildings				
292622	302800	38.79	902.41	30	Group of dwellings	Buildings associated with viewpoint 29 and local road	The proposals are predicted to be substantially screened from view by buildings (ID 29) in the foreground. Part of the proposed chimney may be clearly visible at short range	H Few	High	Medium-large	Moderate-major
292505	302754	38.53	987.66	31	Dwelling house	Woodland	The proposals are predicted to be screened from view by vegetation in the foreground. In wintertime, views are likely to be gained at short range albeit filtered through leafless vegetation	H Few	High	Medium-large	Moderate-major
292361	302713	38.63	1046.54	32	Group of bungalow dwellings	Woodland and farmland.	Views of the proposals, namely the chimney stack and upper portions of some of the buildings are likely to be visible through a gap in the existing woodland above the level of a ridgeline in the foreground	H Few	High	Medium-large	Moderate-major
292296	302698	39.49	1123.21	33	Group of bungalow dwellings	Woodland and farmland	The proposals are expected to be substantially screened from view by vegetation in the foreground. In wintertime, filtered views of at least the chimney stack may be available.	H Few	Low	Barely perceptible	Not significant
294340	303222	38.82	1470.44	34	Dormer bungalow	Electricity Station located in Monavallet. Open relatively flat farmland	The proposals, albeit located close to the viewer, will be not as clearly visible owing to the presence of the Electricity Station at Monavallett	H Few	Low	Barely perceptible	Not significant
294563	303270	33.59	1715.01	35	Bungalow dwelling	Boundary conifer hedging to curtilage of property	The proposals are predicted to be screened from view	H Few	Low	Nil	Not significant
295051	303465	37.24	2208.47	36	Settlement cross roads	Electricity Station located in Monavallet. Open relatively flat farmland	The proposed chimney stack and parts of the power plant buildings are likely to be clearly visible although this view will include the existing electricity infrastructure which currently detracts from the scenic quality	HT Mod	Low	Small	Not significant
295273	302406	39.59	1994.37	37	Location on local road near group of dwellings	Gently rolling farmland. Hedgerows and scattered vegetation groups.	Proposed chimney stack is likely to be clearly visible. The power plant buildings are likely to be screened substantially by intervening vegetation	HT	Moderate	Medium	Moderate
291673	303406	38.97	2032.87	38	Point location on designated scenic road route R178	Low lying gently rolling farmland. Hedgerows.	Proposed chimney stack and part of the power plant buildings are likely to be clearly visible albeit against a wider skyline.	RT Many	Moderate - High	Medium	Moderate to major
295650	301398	34.75	2556.63	39	At the edge of Louth Town, near church ruin	Long range views over farmland. Power lines.	The proposed chimney stack is likely to be visible as a relatively small but clearly identifiable element in the wider skyline.	HRT Many	Moderate	Medium	Moderate
297159	301712	40.01	3873.90	40	East of Louth town along designated scenic route R171	Open farmland. Powerlines, scattered dwellings.	The proposed chimney stack is likely to be visible as a relatively small element above the line of existing vegetation.	HRT Many	Moderate	Medium	Moderate

Grid Ref Easting	Grid Ref Northing	Elevation in Metres	Distance to Site in metres	Illustrated viewpoint	Description Of viewpoint	Components in existing view	Proposed view	Viewer type & number	Viewer Sensitivity	Magnitude of change	Significance of imapct
299303	304276	40.21	6371.50	41	Point on track located north of Knockbridge town.	Open farmland. Powerlines, scattered dwellings.	The proposals are likely to be screened from view by intervening vegetation in summertime. In winter views through leafless vegetation may be available.	HR Low	Moderate	Barely perceptible	Not significant
294464	299225	30.33	3472.20	42	Point on minor road North of Tallanstown	Open farmland. Power lines, neatly managed hedgerows.	At least part the chimney stack associated with the proposals is predicted to be clearly visible.	HT Mod	Moderate	Medium	Moderate
294564	294389	36.81	8134.63	43	Point on minor road off the N2 National route north of Ardee town	Open farmland. Power lines.	At least the chimney stack associated with the proposals is predicted to be visible subject to weather conditions. The hedgerow vegetation and presence of mature trees in the distance are likely to assist in the screening of the power plant buildings.	HT Few	Moderate	Small	Slight
283348	303652	71.46	8133.45	44	Western edge of the town of Carrickmacross	Drumlin Farmland. Woodland groups and scrub. Scattered dwellings.	The proposals are likely to be substantially screened from view by vegetation in the foreground. Visibility through the vegetation may be possible in wintertime. It is likely that the proposals will be difficult to see.	H Many	Low	Barely perceptible	Not significant
282142	303702	99.07	11145.11	45	Track located west of the town of Carrickmacross.	Farmland, urban centre of Carrickmacross, Long range views over wider countryside.	Distant views are likely to be gained of the proposed chimney as a relatively small element in the wider skyline.	R Few	Low	Barely perceptible	Not significant
280731	302449	71.99	12644.87	46	Point on minor road located west of the town of Carrickmacross.	Panoramic views of wider countryside. Lough Bougagh in foreground. Woodland associated with Lough Fea.	Distant views are likely to be gained of the proposed chimney as a relatively small element in the wider skyline. The viewer's attention is likely to be focused on the scenic landscape of drumlins and Loughs in the foreground.	T Mod	Low	Barely perceptible	Not significant
291356	314849	134.23	12923.31	47	Residential area South of Crossmaglen Town (St Joseph's Place)	Long range views over wider countryside.	Distant views are likely to be gained of the proposed chimney as a relatively small element in the wider skyline.	T Many	Low	Barely perceptible	Not significant
302736	318501	195.32	18736.66	48	Minor road at the foot of Slieve Gullion.	Long range views of wider countryside through valley between Slieve Gullion and the town of Forkill	The proposed chimney is likely to be visible in the far distance as a relatively inconspicuous element. The focus of the viewer is also likely to be centred on the scenic mountain and valley landscape in the foreground.	RT Many	Low	Barely perceptible	Not significant
301599	315449	93.58	15524.85	49	Edge of the town of Forkill	Open flat farmland. Power lines and supporting structures (towers). Slieve Sheen.	Distant views are likely to be gained of the proposed chimney as a relatively small element in the wider skyline.	T Many	Low	Barely perceptible	Not significant
302473	313387	70.09	14638.18	50	Point on minor road off R177 route North of Kilcurry	Open flat farmland. Power lines and supporting structures (towers). Slieve Sheen.	Distant views are likely to be gained of the proposed chimney as a relatively small element in the wider skyline.	T Many	Low	Barely perceptible	Not significant

Grid Ref Easting	Grid Ref Northing	Elevation in Metres	Distance to Site in metres	Illustrated viewpoint	Description Of viewpoint	Components in existing view	Proposed view	Viewer type & number	Viewer Sensitivity	Magnitude of change	Significance of imapct
305962	312502	98.36	16282.26	51	Faughart Hill	Long range views of wider countryside including Dundalk Bay and Dundalk urban area.	The proposed chimney stack is likely to be visible as a relatively minor element in the wider skyline. The extent of visible urban development will serve to further reduce the significance of the impact of the proposed chimney on the viewer.	RT Few	Low	Barely perceptible	Not significant
285266	292829	101.99	12359.40	52	Point on minor road off the R165 route between Drumconrath and Kingscourt.	Open farmed landscape, Power lines.	The proposed chimney stack is likely to be visible as a relatively slender element in the wide landscape setting currently visible.	T Few	Low	Barely perceptible	Not significant
278426	295523	125.67	16269.86	53	Church at Kingscourt.	Town buildings in foreground. Wide range view of rural farmed landscape in background.	Views of the proposed chimney stack are likely to be scarcely available. Availability of these views will vary depending on the precise location of the viewer in the churchyard owing to the presence of vegetation screens.	HR Many	Low	Barely perceptible	Not significant
297189	287836	91.84	14777.27	54	Point on Minor road off N2 National Route South of Ardee	Panoramic and long ranging views of gently rolling farmland.	Views of the proposed chimney stack are likely to be scarcely available and dependant on the precise location of the viewer as there are few scattered mature trees in the foreground. Weather conditions will affect visibility.	HT Mod	Low	Barely perceptible	Not significant
297324	286528	110.54	16159.49	55	On the N2 National Road Route south of Ardee	Panoramic long range views from an elevated location of gently rolling farmland.	The chimney stack is likely to be visible only as a very small or slender and relatively inconspicuous element in the wider skyline. Availability of views will be dependant on weather conditions.	T Many	Low	Barely perceptible	Not significant
297566	283261	222.03	19373.24	56	At the designated viewing point associated with Mount Oriel.	Gently rolling farmland in foreground. Long range views of wider landscape.	Views of the proposals are likely to be screened by hedgerow vegetation in summer. In winter the proposed chimney stack may be exposed to view.	RT Few	Low	Barely perceptible	Not significant
310656	311096	110.18	19246.46	57	The Tain Way walking route on foothills of Black Mountain	Drumenagh Hill in foreground. Developed areas surrounding Dundalk including the racecourse. Flat farmland in the far distance.	Chimney stack proposed is likely to be barely visible and relatively less conspicuous given the urban development present in this landscape. In reality difficult to find with the naked eye certainly in weather conditions that reduce visibility in the long range.	R Few	Low	Barely perceptible	Not significant
311589	309884	114.47	19565.28	58	Minor road at foot of Round Mountain	Dundalk Estuary. Urban area associated with Dundalk. Flat farmland in far distance.	The chimney stack is likely to be visible albeit difficult to find particularly in weather conditions that cause reduced visibility. It is likely to be less conspicuous against the developed backdrop described in the existing view.	HT Few	Low	Barely perceptible	Not significant
305931	295786	19.14	13841.56	59	Edge of Castlebelling-ham.	Farmland and hedgerows with mature trees.	The vegetation in the foreground is predicted to screen views of the proposals.	HT Many	Low	Nil	Not significant

Grid Ref Easting	Grid Ref Northing	Elevation in Metres	Distance to Site in metres	Illustrated viewpoint	Description Of viewpoint	Components in existing view	Proposed view	Viewer type & number	Viewer Sensitivity	Magnitude of change	Significance of imapct
304095	287852	80.85	17701.53	60	On minor road at edge of Dunleer town.	Long range panoramic views of farmland. Scattered buildings. Spire of church at Dromin. Slieve Gullion and Cooley Mountains in far distance.	The chimney stack is likely to be visible albeit as a relatively slender and small component in the wider landscape setting.	HT Many	Low	Barely perceptible	Not significant
304095	287852	81.04	17573.12	61	On minor road at edge of Dunleer town.	Long range panoramic views of farmland. Scattered buildings. Spire of church at Dromin. Slieve Gullion and Cooley Mountains in far distance.	The proposals are likely to be visible albeit difficult to find particularly in weather conditions that cause reduced visibility.	HT Many	Low	Small Impercepti-ble	Not significant

Viewer type: H= residential; T= traveller; R= recreational; W=workers

Viewer numbers: Many > 50 a day; Mod 15-50 a day; Few 0-15 a day

Significance: minor; moderate; major

5.9 Landscape and Visual Impacts During Construction and Maintenance

During construction, there will be short term landscape and visual impacts from plant and activities on the site including the following:

- Site compounds, temporary fencing, access;
- Machinery and material storage;
- Plant and machinery including cranes, lifting equipment, excavators and earth moving equipment;
- Clearance of vegetation, forest felling and topsoil stripping;
- Borrow pits;
- Road works;
- Dispersion of dust up to a distance of 150m
- Vehicle movements in the site and on adjacent roads including vehicles carrying parts of the proposed structures to the site as detailed in the construction activities and traffic sections of this EIS;
- In-situ concrete works including excavations for foundations;
- Tall cranes; and
- Construction site lighting in winter months.

These will cause substantial impacts which will be restricted either to the duration of the relevant activity or to the duration of the restoration period. These medium term impacts during restoration will only affect viewpoints close to the site from which ground conditions will be discernible.

In addition, whilst the power plant is operating, there are likely to be occasions where activities involving the use of plant and machinery will be required to undertake maintenance and repair works. These are expected to cause short term visual impacts.

Measures that will be taken to mitigate landscape and visual impacts during construction will include:

- Design to minimise land take;
- Design to minimise tree and other vegetation removal;
- Protection of valued features, such as wetland, heath, historic features and old stone walls, using fencing to keep contractors out of areas where damage may result;
- Control of after dark construction lighting so that it does not impinge into sensitive views, for example from residential windows;
- Maintenance of tidy and contained site compounds; and
- The spreading of topsoil and replacement of turf, or reseeding and planting as soon as possible after sections of work are complete.

5.10 Limitations of this Assessment

The scope of this assessment is limited to the proposed access road and the proposed power plant site as illustrated in *Figure 5.5a* and *b*.

Whilst the assessment process was under way, Louth County Council were invited to comment on the choice of locations for illustration as photomontage however their opinion could not be obtained in the time available.

Table 5.5: Proposed Planting Mixes

Proposed Planting Mix	Species Content	Approx % of mix
Proposed high canopy woodland mix planting – ref Figure 5.5a and b.	Scots Pine (*Pinus sylvestris*) Ash (*Fraxinus excelsior)* Pedunculate Oak (*Quercus robur)*	High canopy dominant species (up to 20% of mix)
	Downy Birch (*Betula pubescens*) Silver Birch (*Betula pendula)* Wild Cherry (*Prunus avium)* Whitebeam *(Sorbus aria)*	Low canopy sub dominant species (up to 25% of mix)
	Hawthorn (*Crataegus monogyna*) Privet (*Ligustrum vulgare)* Holly (*Ilex aquifolium)* Elder *(Sambucus nigra)* Blackthorn (*Prunus spinosa)*	Shrub understorey and edge species(up to 55% of mix)
Proposed low canopy woodland with shrub understorey – ref Figure 5.5a and b.	Scots Pine (*Pinus sylvestris*) Ash (*Fraxinus excelsior)* Pedunculate Oak (*Quercus robur*	High canopy dominant species (up to 10% of mix)
	Downy Birch (*Betula pubescens)* Silver Birch (*Betula pendula)* Wild Cherry (*Prunus avium)* Whitebeam *(Sorbus aria)*	Low canopy sub dominant species (up to 30% of mix)
	Hawthorn (*Crataegus monogyna*) Privet (*Ligustrum vulgare)* Holly (*Ilex aquifolium)* Elder *(Sambucus nigra)* Blackthorn (*Prunus spinosa)*	Shrub understorey and edge species(up to 60% of mix)
Proposed hedgerow – ref Figure 5.5a and b.	Hawthorn *(Crataegus monogyna)* Privet *(Ligustrum vulgare)* Blackthorn (*Prunus spinosa)*	

5.11 Summary Conclusion

The impact of the proposed development on landscape elements, landscape character and visual amenity was assessed. Both impacts during the construction phase and long term impacts during the operational phase were assessed. The assessment of long term impacts took account of mitigation measures relating to the orientation of the site layout which favoured an easterly location for the stack in the interest of the visual amenity of residents of dwellings located to the south and west. The finishes of the proposed structures (in terms of colour and reflectance) are to be chosen to favour reduction of potential visual impact. The location for the proposals, in a localised hollow is expected to result in partial screening for viewers from some of the selected viewpoint locations.

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, site compounds, earthworks and temporary lighting.

Long term direct impacts on the landscape include permanent loss of undeveloped land together with vegetation losses and some sections of stone walling. The indirect effect on the character of the wider landscape was assessed using a computer generated Zone of Visual Influence which covered a 20 kilometre radius from the centre of the site. The indirect adverse impacts on the receiving landscape character were assessed in the context of local landscape character areas as derived by ERM. These were assessed as being major for the Louth Lowland Farmland LLCA, minor for the Fane and Glyde Riverine and Wetland LLCA and Not Significant for the Carrickmacross Drumlins and Loughs LLCA. Further afield outside of these LLCAs and at greater distances from the site, the proposals are expected to have an indirect adverse effect because of its visibility from various locations. These impacts are generally assessed as being minor to not significant.

Long term visual impacts were assessed from 61 viewpoint locations representing a range of viewer types including residents of dwellings, recreational users and those engaged in travel. Adverse visual impacts of a major significance are expected to arise in the viewpoints located at least 1 kilometre from the site. In some cases, adverse impacts of a moderate to major significance are expected to arise in the locations where partial screening of the proposals is expected to occur as a result of the local topography or the presence of buildings. The visual impact of the proposals is expected to be not significant at viewpoints located at distances of greater than 7 kilometres from the site.

The proposed stack, being the tallest element is expected to be viewed as a relatively small to inconspicuous element in the skyline

6 Roads and Traffic

6.1 Introduction

This chapter of the EIS deals with the impact of the development on roads and traffic. A detailed description of the development proposed can be found in *Chapter 3* of this EIS.

6.2 Methodology

It was assumed for the purposes of this report that construction will be complete in 2010 subject to planning. The report has been prepared in accordance with the *"Guidelines for Traffic Impact Assessments 1994"* as published by the Institution of Highways & Transportation U.K. A Traffic Impact Assessment (TIA) was carried out to assess the traffic impact of the development on the existing road network and design the most effective junction types to best accommodate the expected traffic volumes generated by the proposed development.

The base year for the development is the year of expected completion for the development and is taken to be 2010. In accordance with the "*Guidelines for Traffic Impact Assessments*", a traffic analysis is required to be undertaken for the Base Year – 2010 and fifteen years from this date i.e., the Design Year - 2025.

As part of this study two-way classified traffic surveys were carried out on the R178 and the LP1143 over a total of 24 days.

Traffic models were generated for the access junctions for the base year and the design year. These models incorporate the projected traffic volumes on the R178 and the LP1143, as described in Section 6.3 and also predicted development traffic as described in *Section 6.5*. The models were created using the PICADY junction modelling package.

6.3 Receiving Environment

6.3.1 Site Location

The site is situated in the townland of Toomes near Ballakelly between Carrickmacross and Dundalk off the R178 in Co Louth. Refer to *Figure 6.1 Junction Location Map*.

The site is a greenfield site and as it currently exists, generates no traffic. The proposed development consists of a Combined Cycle Gas Turbine (CCGT) 450 MW Power Plant.

The site is located in a predominately agricultural area between the LP1143 and the CR154. The development covers a total area of 36 acres, of which 8.1 acres is being given to ecological mitigation. The site extends to the LP1143 approximately 680 metres from Ballakelly Crossroads. There is an existing ESB substation located to the south of Ballakelly Crossroads.

6.3.2 Local Road Network

Road access to the development is proposed via a new link road, which will run from the R178 to the LP1143 where it forms a T-junction with the LP1143. From there traffic will access the development via the development access on the LP1143. Refer to *Figures 6.2* to *6.6 junction layout drawings*.

The R178 is a regional road of approximately 6.0 metre road width in the vicinity of the development. The LP1143 is a local road of varying road widths, between 6.0 and 4.0 metres.

During the Construction Phase of the development road improvement works are also planned along the R178 towards Carrickmacross. Consequently a section of the R178 may be closed at some stage during the Construction Phase. Access to the site during the road works can be gained from the R178 for traffic coming from the Dundalk direction but traffic coming from the Carrickmacross direction will be directed towards Inishkeen along local road diversions which will tie-into the R178 at Chanonrock, east of the site access. Traffic will come via the R178 from Carrickmacross and Dundalk if road works are not in place. It is likely that cars and LGVs travelling to the development during the construction phase will use the LS5147 from Garlegobban and the LP1143 to access the development instead of taking the diversion since this is the shortest route to the site.

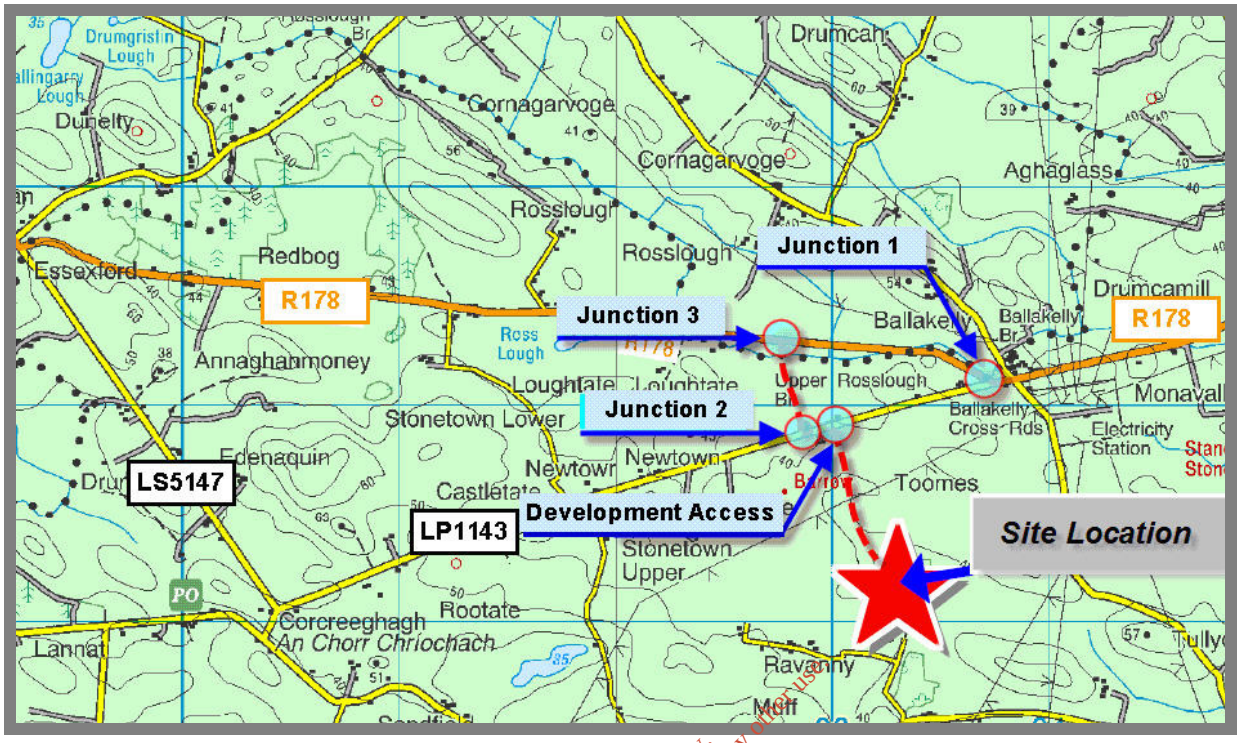
While the roadworks are in progress all HGV traffic must travel via Dundalk. This will mean that all Heavy Goods Vehicles (HGVs') travelling to the development during the period of the road works will approach the site access along the R178 from an easterly direction. The proposed new link road from the R178 joining the LP1143 will accommodate HGVs and buses during this time. It is likely that cars and Light Goods Vehicles (LGV's) travelling from the Carrickmacross direction will travel via the LS5147. However, given the proximity of the proposed development to Stonetown National School (approximately 700 metres to the west of the development access road) all construction related traffic will be encouraged to use the link road as described above. Development related HGV traffic will not pass the school at any stage of the construction or during the operation of the development.

As part of this study traffic surveys were carried out on the R178 and the LP1143. The traffic counts were conducted from 20th January 2006 to 6th February 2006 for the R178 in both directions, and from 2nd to 6th March 2007 in both directions for the LP1143. Consultation meetings were held with Louth and Monaghan County Council engineers where junction alignment, traffic levels and mitigation measures were discussed. Traffic count data was provided by Louth County Council.

The junctions examined in this study are highlighted in *Figure 6.1.* The junctions are:

1. Junction of R178 and LP1143 near Ballakelly crossroads.
2. Junction of LP1143 and Access Road northwards to R178.
3. Junction of R178 and Access Road.
4. Development Access southwards to development.

Figure 6.1: Junction Location Map



The vehicle figures in *Tables 6.1* and *6.2* in the following pages represent the busiest recorded day of each traffic count period, Thursday January 26th for the R178 and Friday March 2nd for the LP1143. The hourly flows recorded for the morning and evening peak hours for the present year, 2007 on both roads are shown in *Table 6.1* and *Table 6.2*.

Traffic counts used for assessment in this study for the R178 and the LP1143 are the highest peak hour counts for two respective time periods. It is considered that the assessment is based on relatively high traffic count volumes ensuring a robust analysis. The traffic data which was collected for this study is included in *Appendix 6.1* of this report.

Table 6.1: 2007 Traffic Count Figures Morning Peak

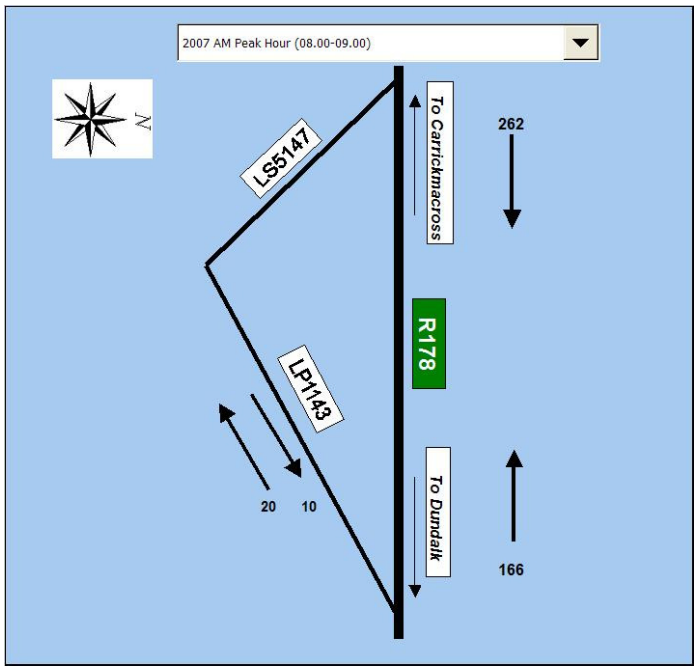
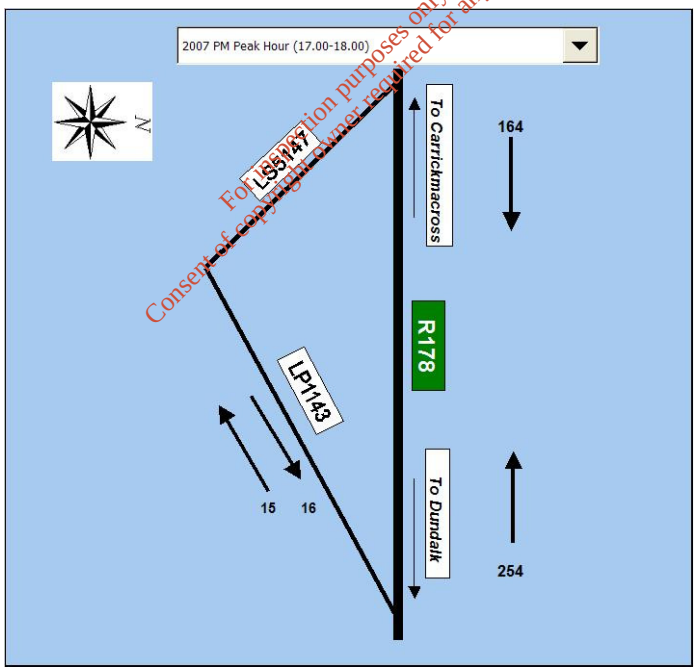


Table 6.2: 2007 Traffic Count Figures Evening Peak



As shown in Table 6.1 and Table 6.2 the morning peak hour flow on R178 is 428 vehicles and the evening peak hour flow is 418 vehicles in the current year, 2007. An approximate extrapolated AADT (Annual Average Daily Traffic) of 7 348 was generated using the all available traffic information.

The traffic surveys on the LP1143 show the flows to be very low with only 30 vehicles using it during the morning peak and 31 vehicles during the evening peak hour. An approximate extrapolated AADT of 565 was estimated for the LP1143.

Picady analysis for each of the four junctions identified in *Section 6.3.2* was carried out for the morning and evening peak hours for the base year 2010 and Design Year, 2025. PICADY (Priority Intersection CApacity and DelaY) is a computer software program dealing with capacities, queue lengths and delays at non-signalised major/minor priority junctions.

6.4 Model Choice and Trip Attraction

To predict the level of traffic that will be generated by the proposed development, the means of transport (modal choice) and quantity of traffic generated (trip attraction) must be considered.

The site, as it currently exists, generates no traffic. During the Construction Phase of the proposed development (approximately 30 months), it is estimated that a total of 4 000 HGV journeys will occur over the 30 months, with a peak estimate of 28 journeys per day (14 x 2).

During the Construction Phase it is predicted that the maximum number of construction workers required on site from Monday to Friday occurs during September 2009. The estimated Construction Worker Traffic Volumes for this time, the peak period of construction, are 200 cars and 30 buses (10 workers / bus) equating to 460 journeys per day. It is assumed that all Construction workers will arrive during the morning peak hour (8:00 – 9:00) and depart during the evening peak hour (17:00 – 18:00). It is also assumed that all HGVs, 28 journeys per day (14 x 2, 7 HGVs arrive and leave during each of the peak hours), will access the site during these peak periods as a worst-case scenario for the purposes of modelling the junctions. This ensures a robust assessment of traffic and road conditions. In reality construction traffic will access the site between the hours of 07.00 and 08.00, thus avoiding peak traffic periods, including school journeys.

During the Operational Phase it is estimated that shift workers will contribute 36 journeys (arriving and leaving) per day (18 workers x 2), day workers will contribute 30 journeys per day (15 x 2) and visitors / deliveries will account for 10 journeys per day (5 x 2). Therefore the total operational phase estimate is 76 journeys per day. It is assumed that all day workers will arrive during the morning peak hour (8:00 – 9:00) and depart during the evening peak hour (17:00 – 18:00). It is also assumed that all shift workers will depart during the morning peak hour (8:00 – 9:00). As for the construction phase assessment, all deliveries and visitors during the operational phase are assumed to access the site during these peak periods as a worst-case scenario for the purposes of modelling the junctions.

The "*Guidelines for Traffic Impact Assessments*" informs us for this type of development the local road network traffic peak occurs on weekdays 8.00 – 9.00 (morning) and 17.00 – 18.00 (evening). This was verified with the traffic surveys outlined earlier in *Section 6.3.2*.

6.5 Trip Distribution

The catchment area for the traffic models being generated is that described earlier. All these generated trips are assumed to be "new" trips. No redistribution of trips from the surrounding network is expected due to the development.

6.5.1 Construction Phase

Construction traffic from Dublin is likely to come along the R178 via Dundalk. It is estimated that 4 wide and heavy loads comprising of two turbines, a generator and a transformer are expected to arrive on site via Dublin Port, with possible additional abnormal loads comprising heat recovery steam generator modules also arriving. The local authorities and the Gardai will be consulted prior to such movements and throughout the construction process. Also it is predicted that 50% of HGV's will come from Co. Fermanagh and 50% from Dublin. Due to the proposed improvement roadworks along the R178 all HGVs and buses will access the site via the proposed access road, which forms a T-junction with the R178. Refer to *Figures 6.2* to *6.6 Junction Layout Drawings*.

The majority of the construction workers will travel from Carrickmacross and Dundalk along the R178. It is planned that the appointed contractors will arrange transport by bus for a significant proportion of these workers. It is expected that 30 buses will transport 300 workers to the site during the peak construction stage.

Road improvement works are planned by Louth County Council along the R178 towards Carrickmacross approximately between January 2008 and January 2010. Consequently part of the R178 may be cut off for the entire duration of these roadworks. Traffic travelling from Carrickmacross will be diverted towards Inishkeen, two-way traffic via Rosslough Bridge; one-way northbound traffic via Cornagarvoge and two-way Dundalk bound traffic via Chanonrock.

Access to the site from Carrickmacross during road works for construction traffic can be gained via the LS5147, which meets the LP1143 at Corcreeghagh. Access to the site from Dundalk can be gained via direct access onto the LP1143 just after the Ballakelly crossroads. However these local road diversions will be unsuitable for buses and HGV traffic. Therefore while the roadworks are in progress all buses and HGV traffic must travel via Dundalk and access the site via the proposed link road from the R178, which will join the LP1143 forming a similar T junction. From this junction development traffic will enter the development via the development access, which forms an additional T-junction with the LP1143. It is intended that HGV traffic from Co. Fermanagh should travel to Dundalk via Castleblayney.

Traffic models included in this report account for traffic movements resultant from the proposed diversions as outlined by Louth and Monaghan County Council engineers in pre-planning discussions.

6.5.2 Operational Phase

This phase refers to the completed project operating as predicted, post production (i.e. from 2010). The current distribution of traffic along the R178 will be used to determine directional split and peak hour split from the proposed development during the operational phase.

These AM and PM peak hour directional split patterns are assumed to remain constant with the passage of time.

Table 6.3: Trip Distribution Directional Split on R178

Trip Distribution	To Dundalk	To Carrickmacross
AM Peak (8.00-9.00)	61%	39%
PM Peak (17.00-18.00)	40%	60%

6.6 Assignment of Development Traffic

The directional splits are as shown in *Table 6.3* above. Therefore we can assign the development traffic as follows:

Morning Peak

- Of 200 vehicles (workers via car) entering the development during the morning peak of the Construction Phase, 61% (122 vehicles) will come from Dundalk and 39% (78 vehicles) will come from the Carrickmacross direction. It is assumed, for the purposes of the analysis, that half of the car traffic coming from the Dundalk direction will use the dedicated entrance on the R178 and that half will travel to the development via the LP1143 from the existing junction near Ballakelly. It was assumed that the remaining car traffic from the Carrickmacross direction will approach the development via the LS5147 and LP1143. All HGVs (7) and buses (30) entering the site will come from Dundalk (37 vehicles) via the new link road between the R178 and the junction on the LP1143.
- Of 37 vehicles leaving the development during the morning peak of the Construction Phase, all will go towards Dundalk as this traffic will consist of HGVs (7) and buses (30) which will follow the diversions.
- Of 20 vehicles (day workers, 15 and visitors/deliveries, 5) entering the development during the morning peak of the Operational Phase, 61% (13 vehicles) will come from Dundalk and 39% (8 vehicles) will come from the Carrickmacross direction.
- Of 5 vehicles (visitors/deliveries, 5) leaving the development during the morning peak of the Operational Phase, 61% (3 vehicles) will go to Dundalk and 39% (2 vehicles) will go to Carrickmacross.
- It is planned that there will be 6 shifts during any 24 hour period with 3 people working during each shift, a total of 18 shift workers. These shifts will not coincide with peak hours.

Evening Peak

- Of 37 vehicles entering the development during the evening peak of the Construction Phase, all will come from Dundalk as this traffic will consist of HGVs (7) and buses (30) which will follow the diversions.
- Of 200 (workers via cars) vehicles leaving the development during the evening peak of the Construction Phase, 61% (122 vehicles) will go to Dundalk as described for the morning peak and 39% (78 vehicles) will go to Carrickmacross. All HGVs (7) and buses (30) leaving the site will go towards Dundalk (37 vehicles).
- Of 5 (visitors/deliveries) vehicles entering the development during the evening peak of the Operational Phase, 3 vehicles will come from Dundalk and 2 vehicles will come from the Carrickmacross direction.
- Of 20 vehicles (day workers, 15 and visitors/deliveries, 5) leaving the development during the evening peak of the Operational Phase, 40% (8 vehicles) will go to Dundalk and 60% (13 vehicles) will go to Carrickmacross.

6.7 Assessment Years

The base year for the development is the year of expected completion for the development and is expected to be 2010. In accordance with the "*Guidelines for Traffic Impact Assessments*", it is a requirement to undertake a traffic analysis for the Base Year – 2010 and fifteen years from this date i.e., the Design Year - 2025.

The growth of traffic from within the development will be expected to remain stagnant over the period 2010 to 2025 assuming no new developments will take place within the site and employment levels and delivery numbers are assumed to remain constant.

The National Roads Authority 2003 publication "*Future Traffic Forecasts 2002-2040*" was used to calculate growth factors for the road network traffic. *Table 6.4* below shows the calculated growth factor to convert from 2007 to 2010 to be **1.078**

Table 6.4: NRA Future Traffic Forecasts, 2007 – 2025

	2007	2010	2025	Growth Factor (2007 – 2010)	Growth Factor (2007 – 2025)
10% HGV	114	123	155	1.078947368	1.359649123
90% Car/LGV	116	125	152	1.077586207	1.310344828
Overall Growth Factor				**1.077722323**	**1.315275257**

The effects of the traffic growth on the existing network plus the additional traffic generated by the proposed development have been compiled to build traffic models of the access junctions. This incorporates the additional traffic from the development with that projected on the R178 and LP1143 for the same year.

6.8 Highway Impact

Developments add traffic to the existing road networks in the immediate vicinity and to a lesser and lesser degree further down stream from the development location. This proposed development will impact on the local road network at the existing junction with the R178 near Ballakelly (Junction 1), at the proposed new junction on the LP1143 (Junction 2), the development entrance and at the proposed new T-junction on the R178 (Junction 3) for the duration of both phases. Therefore the analyses of the performance of these four junctions are the main concern of this report.

Traffic models were produced for the 2010 Base Year and the 2025 Design Year scenarios. These models incorporate projected thru-traffic, and also predicted development traffic as described.

The current two-way AADT (Annual Average Daily Traffic) on the LP1143 at this location is of the order of 565 vehicles. This is the Major Road Flow for the development access. By the Base Year date 2010 this existing traffic flow will have increased at a growth rate of 1.078 to an approximate figure of 609 vehicles per day. By the Design Year date 2025 this existing traffic flow will have increased at a growth rate of 1.315 to an approximate figure of 743 vehicles per day. This projection is based on a NRA growth factor as outlined previously.

The total traffic generated by the development will be in the order of 488 journeys per day during the Construction Phase and 76 journeys per day during the Operational Phase. This translates to a two-way AADT of 1097 vehicles for the proposed link road between the R178 during the Construction Phase. For the Operational Phase this translates to a two-way AADT of 787 vehicles for the LP1143.

From the graph Figure 2/2 of the NRA DMRB TD42/9 "*Geometric Design of Major/Minor Priority Junctions*" in the above-mentioned design handbook it can be seen that a "Simple" t-junction would be required for the Base Year (Construction Phase) and for the Design Year (Operational Phase). It is not required to provide a right-turn lane or other measures to accommodate traffic at the junction. The drawings (*Figures 6.2* to *6.6*) show a suitable layout for the junction at this location.

The current two-way AADT (Annual Average Daily Traffic) on the R178 at this location is of the order of 7 348 vehicles. This is the Major Road Flow for the development access. For the Base Year date 2010 traffic flow will have increased at a growth rate of 1.078 to an approximate figure of 7 921 vehicles per day. By the Design Year date 2025 this existing traffic flow will have increased at a growth rate of 1.315 to an approximate figure of 9 663 vehicles per day. This projection is based on a NRA growth factor as outlined previously.

As already mentioned the total traffic generated by the development will be in the order of 488 journeys per day during the Construction Phase and 76 journeys per day during the Operational Phase. This translates to a two-way AADT of 8 409 vehicles for Junction 4 on the R178 during the Construction Phase and 9 707 vehicles during the Operational Phase.

From the graph Figure 2/2 of the NRA DMRB TD42/9, it can be seen that a "ghost island" junction would be required for the Base Year (Construction Phase) but not for the Design Year (Operational Phase). However a "ghost island" junction will not be necessary at this location as the Picady analysis shows that no significant queuing will take place at this location. The discrepancy is generated by the fact that all vehicles travelling to the proposed new access road will make left turn movements onto the new road compared to no right-turn movements. This is due to the closure of the R178 to the west of the development, requiring all traffic to approach the junction from the east, thereby meaning only left-turn movements at the junction. This inherently means that there is no need for a right-turn lane for the 2010 scenario and during the construction stage of the development. Picady results indicate that there is no requirement for a right-turn lane for the 2025 scenario. This is due to the relatively low levels of traffic produced by the development once operational and considers the operation of the junction purely from a capacity point of view.

It has been decided, however, that a right-turn lane should be incorporated in the junction layout for road safety reasons. This measure will be put in place due to the relatively narrow carriageway for the existing road and the high-speed nature of the road. The junction has been designed in accordance with DMRB specifications and comprises of a 'Turning and Queue Length' of 5 metres, a 'Deceleration Length' of 55 metres, a 'Direct Taper Length' of 15 metres and a 'Central Island taper' of 75 metres (1:25). The proposed right-turn lane is 3.0 metres wide. Following consultation with Louth County Council, with regard to this junction, it has been determined that the proposed taper should run at 1:10 given the level of traffic on the R178. This taper length has been incorporated in the junction design. *Figure 6.4* shows the junction layout for the location as described.

The junctions, as shown in *Figures 6.2* to *6.6*, are designed to cater for the expected traffic levels for both the proposed development and projected thru-traffic.

The design of junction 2 and the development access, both on the LP1143 is based on NRA DMRB specifications and 'Autoturn', vehicle swept path analysis. Corner radii of 15 metres with 1:8 taper distances of 32 metres are provided at the junction and development access. This provides adequate room for heavy goods vehicles swept path movements. The road is currently approximately 4.5 metres in width in the vicinity of the proposed junction. It is proposed to widen the road to 6.0 metres at the junctions, as well as providing the 32 metre tapers. Road widths, junction radii and taper lengths are shown on *Figure 6.3*.

Visibility Splays for each of the proposed junctions are shown in *Figures 6.5* and *6.6*. As shown the visibility splays provided are 160 metres at 4.5 metre offset and are in compliance with DMRB standards.

Future year traffic levels are shown in Tables 6.5 to 6.10 showing projected traffic levels at all junctions considered in this report.

A junction with an r.f.c. (ratio of flow to capacity) value of 0.85 signifies that it is operating at 85% of its saturation level. It is considered good practice to maintain degrees of saturation of 85% and lower when designing junctions and traffic networks. As can be seen from the analyses results the junctions operate well within capacity with negligible queuing for both morning and evening peak hour analyses. This suggests that a "simple" priority t-junction is adequate to cater for the expected traffic levels.

Table 6.5: 2010 Traffic Movements Morning & Evening Peak at Junction 1

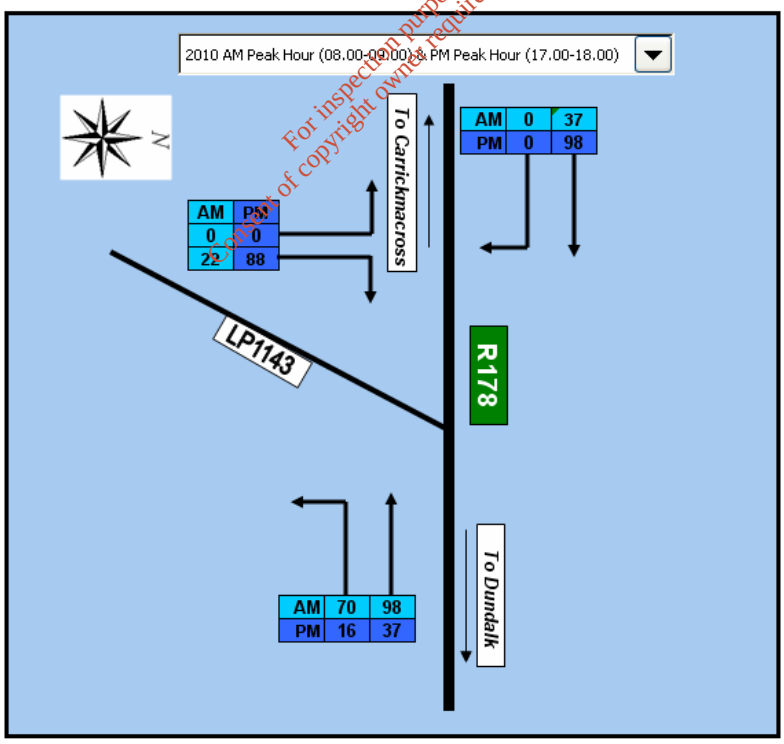


Table 6.6: 2025 Traffic Movements Morning & Evening Peak at Junction 1

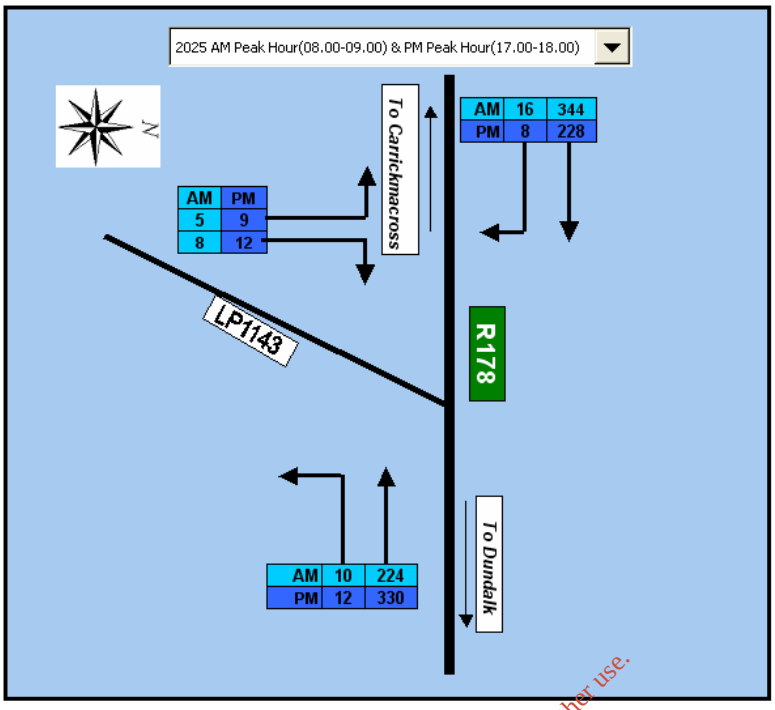


Table 6.7: 2010 Traffic Movements Morning & Evening Peak at Junction 2 & Access Junction

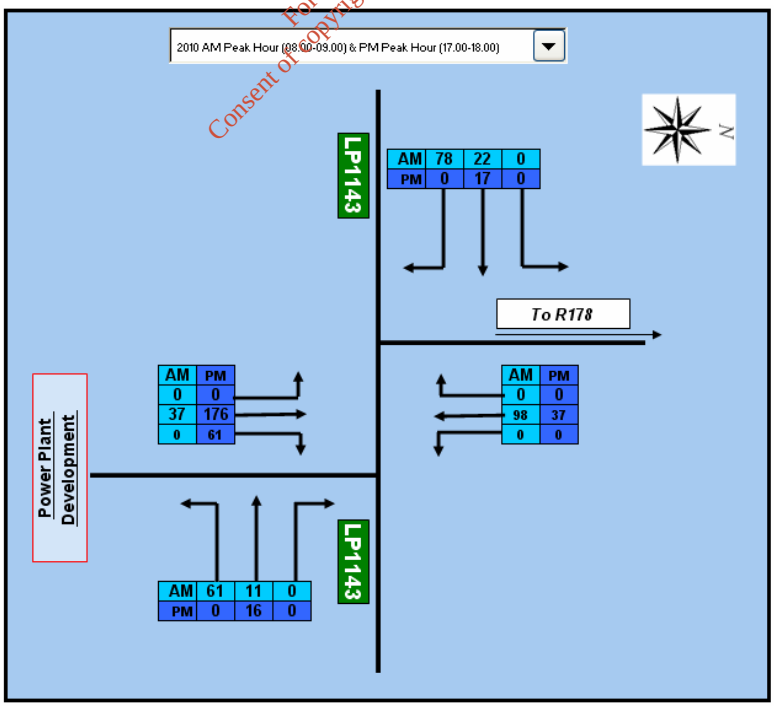


Table 6.8: 2025 Traffic Movements Morning & Evening Peak at Junction 2 & Development Access

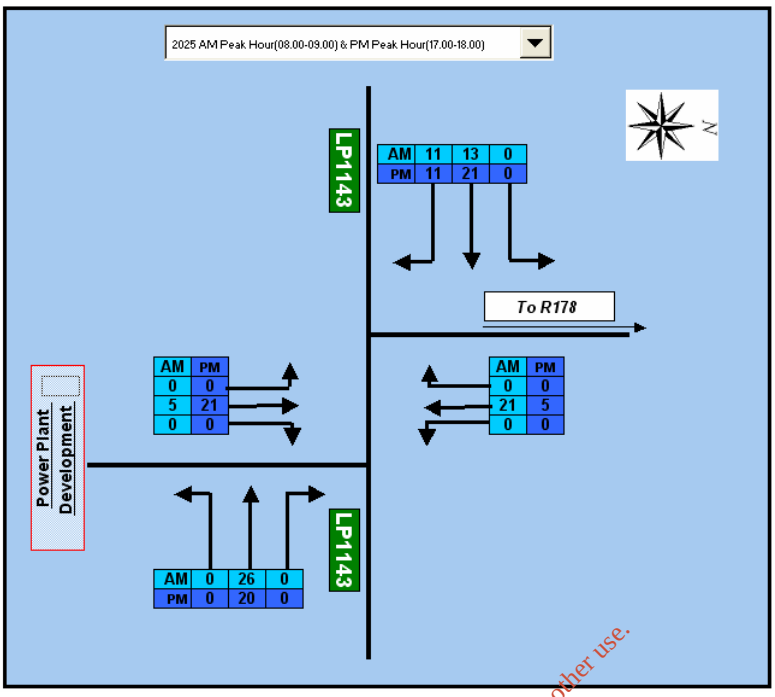


Table 6.9: 2010 Traffic Movements Morning & Evening Peak at Junction 4

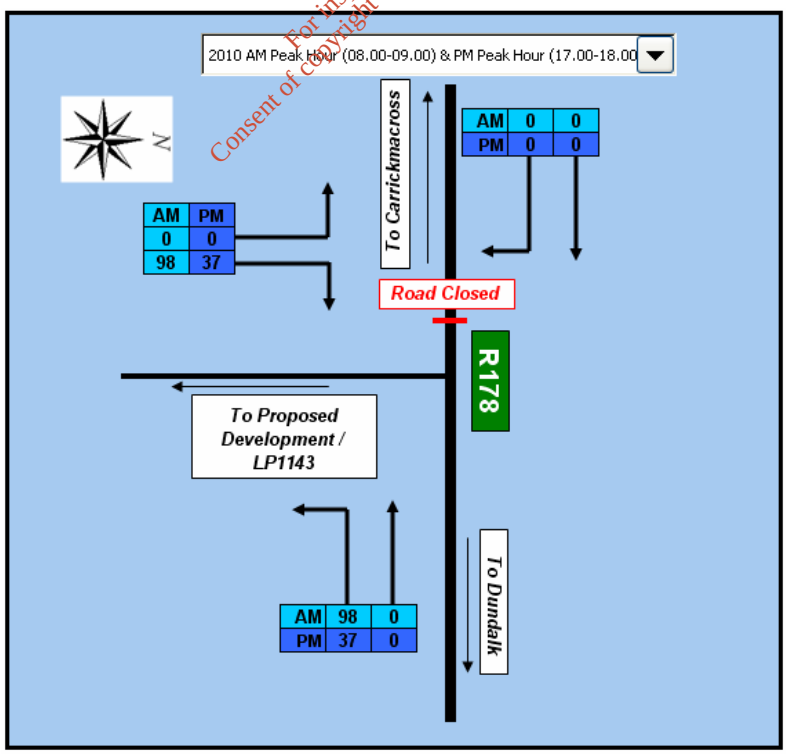


Table 6.10: 2025 Traffic Movements Morning & Evening Peak at Junction 4

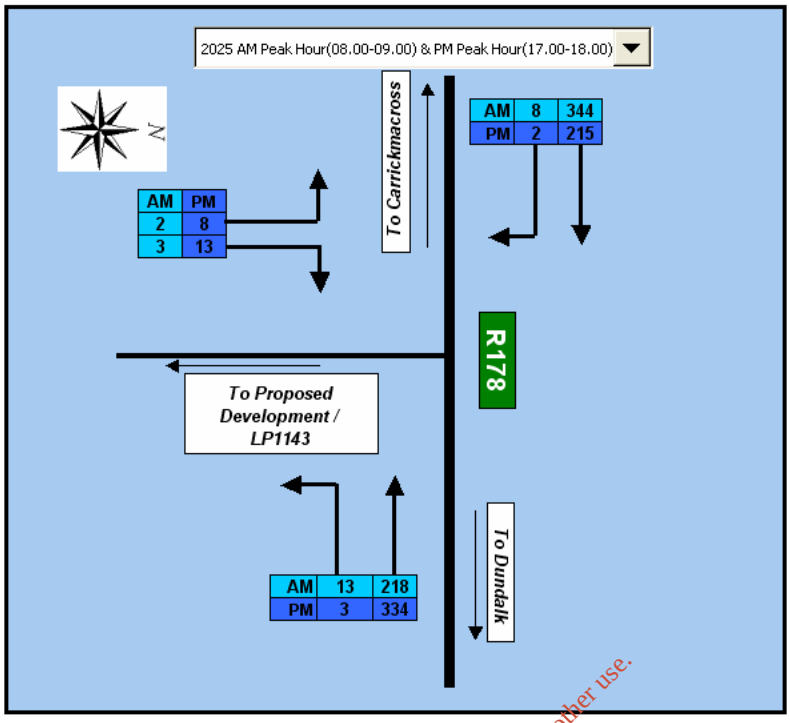


Table 6.11: JUNCTION 1 - EXISTING T JUNCTION ACCESS ONTO R178 ROAD from LP1143

Traffic Stream	Movement	Degree of Saturation	Max Car Queue
8.00a.m.-9.00a.m. 2010			
B-AC (Coming from LP1143)	L,R	3.0%	0.0
5.00p.m.-6.00p.m. 2010			
B -AC (Coming from LP1143)	L,R	22.4%	0.3
8.00a.m.-9.00a.m. 2025			
B-AC (Coming from LP1143)	L,R	3.8%	0.0
5.00p.m.-6.00p.m. 2025			
B-AC (Coming from LP1143)	L,R	5.8%	0.1

Analysed for Base Year 2010 am/pm and for Design Year 2025 am/pm

Result: The junction operates within capacity for all three legs up to and including the Design Year 2025. The maximum r.f.c value for the overall junction is 22.4% and the maximum queue length is 0.3 on the LP1143. The junction is operating within capacity.

Note: L- Left Turn, S – Straight on, R – Right Turn

Table 6.12: JUNCTION 2 & DEVELOPMENT ACCESS ONTO LP1143 ROAD

Traffic Stream		Movement	Degree of Saturation	Max Car Queue
Junction 2 2010- 8.00a.m.-9.00a.m. 2010				
B-AC	(Coming from Link Rd to R178)	L,R	19.1%	0.2
CD-B	(Right-turn to Development)	L,R	7.5%	0.1
Junction 2 2010- 5.00p.m.-6.00p.m. 2010				
B-AC	(Coming from Link Rd to R178)	L,R	7.2%	0.1
CD-B	(Right-turn to Development)	L,R	18.6%	0.2
Junction 2 2025- 8.00a.m.-9.00a.m. 2025				
B-AC	(Coming from Link Rd to R178)	L,R	0.9%	0.0
C-B	(Right-turn to Development)	L,R	4.0%	0.0
Junction 2 2025- 5.00p.m.-6.00p.m. 2025				
B-AC	(Coming from Link Rd to R178)	L,R	9.1%	0.1
CD-B	(Right-turn to Development)	L,R	4.0%	0.0
Development Junction 2010- 8.00a.m.-9.00a.m. 2010				
B-AC	(Coming from Link Rd to R178)	L,R	7.4%	0.1
CD-B	(Right-turn to Development)	L,R	24.5%	0.3
Development Junction 2010- 5.00p.m.-6.00p.m. 2010				
B-AC	(Coming from Link Rd to R178)	L,R	49.3%	0.9
CD-B	(Right-turn to Development)	L,R	6.1%	0.1
Development Junction 2025- 8.00a.m.-9.00a.m. 2025				
B-AC	(Coming from Link Rd to R178)	L,R	2.3%	0.0
C-B	(Right-turn to Development)	L,R	4.0%	0.0
Development Junction 2025- 5.00p.m.-6.00p.m. 2025				
B-AC	(Coming from Link Rd to R178)	L,R	4.1%	0.0
CD-B	(Right-turn to Development)	L,R	0.9%	0.0

Analysed for Base Year 2010 am/pm

Result: Both junction 2 and the development access operate well within capacity for all four legs for the Base Year 2010. The maximum r.f.c value for both junctions is 49.3% and the maximum queue length is 0.9 from the development turning left. The junction is operating within capacity.

Note: L- Left Turn, S – Straight on, R – Right Turn

Table 6.13: JUNCTION 4 - T JUNCTION ACCESS ONTO R178 ROAD

Traffic Stream	Movement	Degree of Saturation	Max Car Queue
8.00a.m.-9.00a.m. 2010			
B-AC (Coming from New Access Road)	L,R	3.2%	0.0
5.00p.m.-6.00p.m. 2010			
B-AC (Coming from New Access Road)	L,R	3.0%	0.0

Analysed for Design Year 2025 am/pm.

Result: The junction operates within capacity for all three legs for the Design Year 2025. The maximum r.f.c value for the overall junction is 3.2% with 0.0 vehicles queuing. The junction is operating within capacity.

Note: L- Left Turn, S – Straight on, R – Right Turn

Full PICADY printout sheets are included in *Appendix 6.2*. From all the Picady analyses it can be seen that no negligible queuing will occur at any of the four junctions for the Base Year and Design Year. Therefore no right turn lanes will be required at any of these locations.

6.9 Internal Layout

The internal layout of the development has been designed by the Design Team for the scheme in order to facilitate the density of development proposed. All turning areas will cater for the turning movements of fire trucks and waste collection vehicles.

6.10 Road Safety Audit

A Road Safety Audit on the junction of the proposed access road to the development and the R178 (junction 3) was requested by Monaghan County Council. This report is included in *Appendix 6.3 Stage 1 Road Safety Audit.* The recommendations included in the report will be addressed in the final road design in consultation with Louth and Monaghan County Councils.

6.11 Parking Provisions

All car park requirements will be contained within the development site and will cater for the predicted 34 arrivals and departures per day along with additional visitor spaces.

6.12 Impacts

The impact of the development throughout both the construction and operational phase is not extensively inhibitive on through traffic and local traffic from a capacity point of view. The Picady capacity analysis of each of the junctions examined in this report suggests that all will operate within capacity throughout construction and operational phases. The introduction of a right-turn lane at the proposed priority junction on the R178 will ensure that the affect on thru traffic on the R178 is minimal.

6.13 Mitigation

During the construction phase the development will produce significantly more traffic. In order to accommodate this additional traffic a number of network changes have been made. It is proposed to provide a link road from the R178 in order to minimise disruption to local traffic in the area. This access road will form a simple priority t-junction with a right-turn lane at the R178. The junction incorporates a 60 metre right turn lane, 40.0 metre taper lengths and 15 metre corner radii, which have been designed to accommodate the likely HGV traffic attracted by the development construction. The link road is to intersect the LP1143 as a t-junction with similar corner radii and 32 metre taper lengths. The development access has been designed to the same specifications.

Traffic levels on local roads will be significantly increased during the construction stage of the development. The introduction of a high number of HGV movements in the area will cause most disruption. A Traffic Management Plan will be developed and implemented in order to coordinate the likely traffic generated during the Construction Phase. The document will include requirements for employee transportation, work start times, delivery times etc. The impact of the development during both the construction and operational phase will be minimised with the construction of the junction on the R178 and adjoining link road to the LP1143.

6.14 Residual Impacts

The proposed development will produce a low level of traffic generation by its nature. It is expected that the plant, once operational will produce 76 trips on a daily basis, which will have a negligible impact on the local road network. Of these trips 30 are resultant from 15 day workers arriving and leaving during peak hours, 10 related to an estimated 5 visitors/deliveries and the remaining 36 due to 18 shift workers. The residual impact of the development on local and thru traffic in the area will be minimal. The construction of the aforementioned infrastructural improvements will facilitate local traffic offering local road users an alternative access to the LP1143, compared to the junction with the R178 near Ballakelly. This junction represents a much safer junction arrangement with right-turn lane, adequate visibility and corner radii.

6.15 Summary Conclusion

A traffic impact assessment was conducted to determine the impact of construction and operational phase traffic on the local environment. During the construction phase it is anticipated that 4 000 HGV journeys will be made with an estimated four wide and heavy loads comprising 2 turbines, a generator and a transformer, with possible additional abnormal loads comprising heat recovery steam generator modules. During the peak construction period it is anticipated that 14 HGV's will access the site daily, in addition to an estimated 500 construction workers. It is anticipated that private buses will be arranged for the majority of construction workers thereby minimising the impact on local roads during this period. A Traffic Management Plan will be developed and implemented in order to coordinate the likely traffic generated during the construction phase. The plan will include requirements for employee transportation, work start times, delivery times etc.

In order to accommodate construction traffic it is proposed to develop a link road from the LP1143, (Stonetown Road) to the R178. This access road will significantly reduce the impact of the construction phase on local traffic in the area. In addition, the link road will direct traffic away from Stonetown National School, located to the west of the link road on the LP1143. Both Monaghan and Louth County Councils were consulted regarding appropriate routing of the link road.

During the operational phase it is anticipated that 36 staff will be employed on site contributing 76 journeys per day, (based on shift workers and day workers). This volume of traffic is not anticipated to impact significantly on the local road network.

Ballakelly Crossroads is located to the east of the proposed access road. The crossroads link the R178 with the LP1143. Sightlines from the junction are poor and considered unsafe. It is envisaged that the new link road will also be used by local traffic providing a significantly safer option for accessing the R178 benefiting the community as a whole.

7 Socio-economic Impacts

7.1 Introduction

This chapter of the EIS identifies the population characteristics, economic activities, amenities, natural resources (of economic value), man-made resources and infrastructure associated with the development site and the surrounding area. Significant impacts likely to affect human beings and material assets are identified and mitigation measures for the construction and operational phases of the development have been proposed where considered appropriate.

7.2 Methodology

7.2.1 Desk Based Review

A desk based review of the area was conducted and information was sourced from publicly available literature. Publications utilised for this assessment included the *Louth County Development Plan 2003-2009* and *Regional Planning Guidelines for the Border Region*. Data from the two most recent population censuses, Census 2002 and Census 2006, were assessed in order to obtain information and identify recent trends in population, employment, economic activity and land usage.

7.2.2 Consultation

Statutory consultation and non statutory consultation was conducted as described in *Chapter 1* of this EIS. The various utility and service providers including Bord Gáis, the Electricity Supply Board (ESB), Eircom, and the local authorities were contacted regarding the location of gas mains, electricity cables, communication cables and water mains within the development area and environs. Monaghan and Louth County Councils provided information on the local road network within their respective administrative areas.

7.3 Receiving Environment

7.3.1 General

The proposed development site is located in a predominantly rural area, in the townland of Toomes on the outskirts of Ballakelly, approximately 2.5 kilometres to the north east of Louth Village and 4.6 kilometres south of Inishkeen. In terms of the proximity of the site to major towns in the region, the proposed site is approximately 11 kilometres southwest of Dundalk, 30 kilometres northwest of Drogheda and 9 kilometres east of Carrickmacross. The proposed site is located only a short distance, (6.5 kilometres) from the N2 national primary route and 12.5 kilometres from the M1.

Toomes is located in the District Electoral Division (DED) of Louth Village. The nearest village, Ballakelly is located in the DED of Inishkeen. The study area for this assessment comprises the proposed development site and the surrounding area.

Information used in the preparation of this report was principally obtained from the Central Statistics Office Website. The principal sources included:

- Census 2006; Principal Demographic Results and Census 2006; Principal Socio-Economic Results;
- Census 2006; Volume 1: Population Classified by Area (published April 2007) and Volume 2: Ages and Marital Status (published May 2007): and
- The Quarterly National Household Survey.

Other sources of information used in the preparation of this chapter include:

- Louth County Development Plan 2003 – 2009 (as amended July 2006)
- Department of Environment, Heritage and Local Government (DEHLG), "National Spatial Strategy for Ireland 2002-2020: People, Places and Potential", (November 2002).

7.3.2 Population

Populations trends are assessed in both a County Wide and Local Context as described below.

County Wide

County Louth is located in the Border Region and is the smallest county in Ireland in geographical terms, covering an area of approximately 821 square kilometres. The county is one of the most densely populated areas outside of Dublin with a population of 111 267 persons recorded in the 2006 Census. The three largest towns in Louth are Drogheda, Ardee and Dundalk. Dundalk and particularly Drogheda are served by good port facilities.

County Louth is strategically located along the Dublin/Belfast corridor with easy access to both Dublin and Belfast via the M1 motorway. The location of the region allows for good access to international airports and port facilities at both Dublin and Belfast.

According to the *Louth County Development Plan 2003 – 2009* (as amended July 2006), the Regional Planning Guidelines have predicted that the population of the Border Region located along the southern side of the border will increase to 529 000 by the year 2020. The population of Dundalk is expected to rise to 60 000 while the population of Drogheda is expected to increase to 50 000 - 60 000. The overall population estimate for Co. Louth in 2020 is 172 000. *Table 7.1 Population Trends* outlines the population trends experienced in County Louth and County Monaghan over the past five years.

As illustrated in *Table 7.1*, the 2006 Census recorded a population of 111 267 in County Louth. This represents an increase of 9 446 persons, (9.3%) since the last Census in 2002. This population increase is above the national average of 8.2%.

Table 7.1: Population Trends

Location	Persons 2002	Persons 2006	Percentage Change 2002 - 2006
Co. Louth	101 821	111 267	9.3
Killanny	***593***	***683***	***15.2***
Ardee Rural	384	393	2.3
Ardee Urban	3 564	4 301	20.7
Tallanstown	443	653	4.6
Louth Village	***514***	***549***	***6.8***
Drogheda Borough	28 333	28 973	2.3
Dundalk	27 385	29 037	6.0
Environs of Dundalk	5 120	6 048	18.1
Co.Monaghan	52 593	55 997	6.5
Inishkeen (Co.Monaghan)	310	292	-5.8
Carrickmacross Urban	1 964	1 973	0.5
Carrickmacross Environs (Ballymackney, Loughfea and Carrickmacross Environs)	1 868	2 414	29.2
State	**3 917 203**	**4 239 848**	**8.2**

Local

The population of Louth Village increased by 35 persons (6.8%) from 2002 to 2006, while the population in the Killanny area, which incorporates parts of Co. Louth and Co. Monaghan, increased by 90 persons (15.2%) in the same period. The DED of Inishkeen, Co. Monaghan, which includes the Ballakelly area, experienced a population decline of 6% from 2002 to 2006. Tallanstown, approximately 4.75 kilometres to the southeast experienced a population increase of 4.6% in the same period.

According to the 2006 census, the Toomes / Ballakelly area experienced a population increase of 5% to less than 10% from 2002 to 2006 and has a population density of 25 to less than 50 persons per square kilometre as illustrated in *Figure 7.1 Percentage Change in Population 2002-2006* and *Figure 7.2 Population Density 2006,* (images reproduced courtesy of Central Statistics Office, Ireland).

Figure 7.1: Percentage Change in Population 2002 – 2006

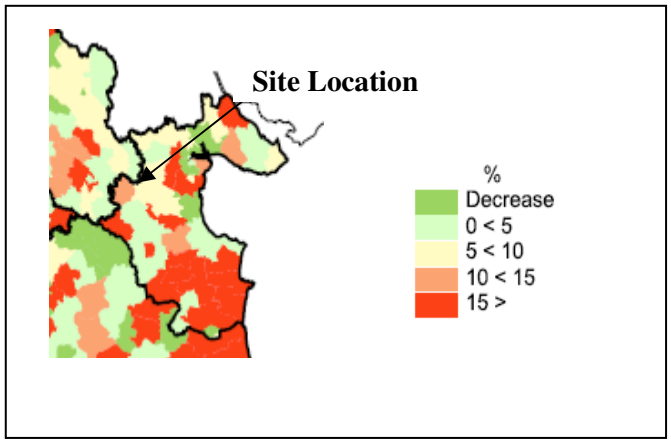
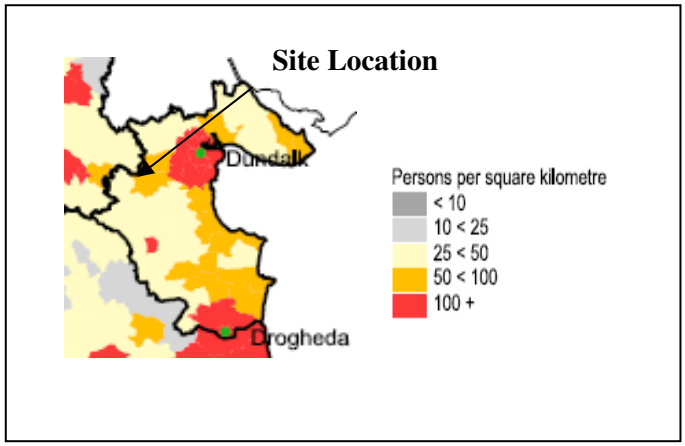


Figure 7.2: Population Density 2006



The key driver of Co. Louth's population growth is the extent of migration into the county. As illustrated in *Table 7.2 Population Increases*, the average estimated net migration per 1 000 of population in Louth was 12.2 compared with 9.8 for Co. Monaghan and 11.4 nationally. Migration is a significant factor because the level of natural increase is relatively low and in decline. In-migration to Louth is primarily dependent on economic development and job creation supported by investment in physical and social infrastructure.

Table 7.2: Population Increases

Location	Natural Increase	Change in Population	Net Migration	Average Annual Rates Per 1000 of Population			
				Birth	Death	Natural Increase	Estimated Net Migration
Co. Louth	3 867	9 073	5 206	15.7	6.6	9.1	12.2
Co. Monaghan	1 098	3 223	2 125	12.7	7.6	5.1	9.8
State	131 314	317 722	186 408	15	7.0	8.1	11.4

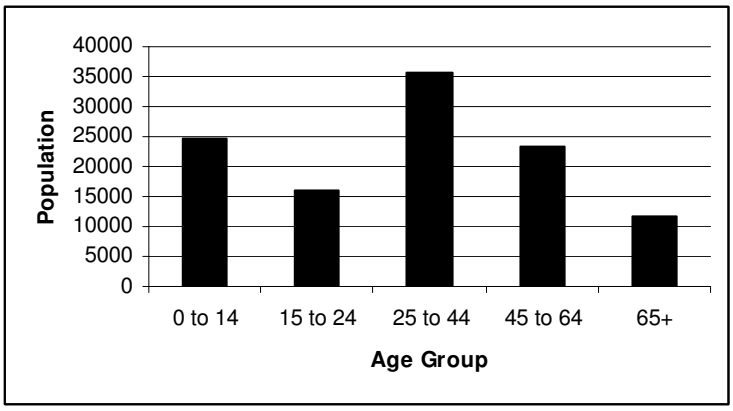
Conclusion

It can be concluded from the assessment of population trends in County Louth that the population is growing with a high net migration into the county acting as the primary stimulant of population growth.

7.3.3 Age Structure

Figure 7.3 illustrates the age structure of the population in County Louth in 2006. It is clear that the county has a young population with 22 % of the population in the 0 to 14 year age group and a further 32% of the county in the 25 to 44 year age group. Only 10% of Louth's population is over 65 years which is below the national average of 11%. This may be indicative of young couples moving to the county and starting families.

Figure 7.3: Age Structure in County Louth (2006)



According to Census 2006, the average household size in Co. Louth is 2.8. This is in line with the national average. According to the National Spatial Strategy Report, in the long term, the average household size in Ireland will continue to fall towards the EU average of 2.63 persons per household.

7.3.4 Employment

According to *Louth County Development Plan 2003-2009*, the majority of employment in Co. Louth is in the manufacturing sector (28%), professional services, commerce (19 %) and electricity and gas sectors (0.8%). A relatively low proportion of the county is involved in farming or agricultural activities (5.9%), emphasising the decline in agricultural employment in recent years. However, in the immediate surroundings of the proposed development site, the predominant source of employment would appear to be agriculture, due to the fact that the area is primarily rural.

Table 7.3 Employment Status (2006), compares the employment status in Co. Louth and Co. Monaghan with the state average. Co. Louth has a marginally lower proportion of persons at work compared with Co. Monaghan and the national average. The percentage of people unemployed in Co. Louth is 2% higher than the Co. Monaghan average and 1.7% higher than the national average. County Louth also has a higher proportion of persons looking for their first job when compared with Co. Monaghan and the national average.

Table 7.3: Employment Status

	At work	Looking for first job	Unemployed	Student	At home/ family	Retired	Sick
County Louth	55.50%	1.10 %	5.90 %	9.60 %	11.60 %	11.00 %	5.10 %
County Monaghan	57.50 %	0.93 %	3.90 %	9.70 %	12.00 %	10.00 %	4.50 %
State	57.20 %	0.87 %	4.4 0%	10.40 %	11.50 %	11.20 %	4.10 %

According to the Live register, 7 233 people were signing on in July 2007 in Co. Louth. This was slightly up on the same period in 2006 where 7 122 people were in receipt of benefits. It is important to note that the live register is not the official measure of unemployment as it includes people receiving benefits who are part time or in casual employment. However it is the most up to date information available and is indicative of the current unemployment situation. As measured by the National Household Survey (the official measure of unemployment), the unemployment rate for the first quarter of 2007 for the Border region, which includes Co. Louth and Co. Monaghan was 5.5 % which is above the national average of 4.4%

7.3.5 Land Use & Zoning

The site of the proposed development is an undeveloped greenfield site. The surrounding land use is agricultural, predominantly pasture land. According to *Louth County Development Plan 2003-2009*, the subject site is located in Development Control Zone 6 which allows for small scale industries, resource based developments, public utility infrastructure and other uses which by their nature and scale are considered appropriate within this zone.

Under the Development Plan, the development area is classified as "Louth Drumlin and Lake Area." The area is not classified as a designated Area of Outstanding Natural Beauty (AONB), an Area of High Scenic Quality (AHSQ), a proposed Natural Heritage Area (pNHA), a Special Area of Conservation (SAC) or a Special Protection Area (SPA).

During the EIS assessment process guidance was sought to determine the impact of this type of development on property valuation, however no guidance was available. This EIS has adequately assessed the impact of the development on the environment and recommended appropriate mitigation measures where necessary. Whilst the power plant will result in a material alteration to land use within the existing field, it is considered that the generation of employment during both the construction phase (up to 500 employees) and the operational phase (36 employees) are likely to positively influence property in the short-term, medium-term and long-term due to the necessity to house employees over the same period.

7.3.6 Public Utilities

There are no existing public utilities running through the proposed development site. However, there are over-ground / underground services situated in close proximity to the proposed development including water mains, sewers, telephone lines and over-ground power lines (associated with the nearby sub-station).

Water will be provided to the site via the Killany-Reaghstown Group Water Scheme with a connection at Ballakelly Crossroads. Gas will be provided from the Bord Gáis Network (BGN) via a new gas pipline to the area. Connection to the Monavallet substation will be via an underground cable. Service connections will be carried out at low demand periods in order to minimise disruption to local supplies.

7.3.7 Roads, Rail and Other Public Transport

The proposed development is located approximately 600 metres south of Stonetown Road, (LP1143) is in close proximity, approximately 800 metres, to the southwest of the regional R178 road. The LP1143 is a quiet road used mainly by locals. However, considering the predominant land use in the area it is considered likely that the LP1143 is also used for cattle crossing. The R178 is a busier road running between Carrickmacross and Dundalk. The closest national road is the N2 (National Primary Route) which is located approximately 6.5 kilometres to the southwest. The N52 and N53 (National Secondary Routes) are also within easy access. The N1 / M1 is situated approximately 12.5 kilometres to the east of the site.

A local bus service stops in Ballakelly providing transport to Dublin, via Dundalk, on a daily basis from 06.00 to 00.00. The closest railway to the proposed site is located in Dundalk. The closest airport is Dublin airport located approximately at 75 kilometres to the southeast by road, Belfast City airport is located approximately 107 kilometres to the northeast.

7.3.8 Businesses in the area

As the general area is rural in characteristics, the predominant businesses in the area relate to agriculture. The area immediately surrounding the proposed site is pasture land mainly used by local dairy farmers. There are also a small number of businesses in the area including a haulage company, grocery store and a petrol station.

7.3.9 Tourism and Amenities

Tourism and amenity assets in Co. Louth comprise an unspoilt natural environment and a rich and varied heritage and culture. The county is in close proximity to major national access points and arterial access routes. Both Dublin and Belfast, Irelands two largest commercial and population centres, are within easy access. This is of key significance to the development of tourism in Co. Louth.

Table 7.4 Overseas Tourism to Louth illustrates the increasing number of overseas tourists visiting Louth since 2004, increasing by 8 000 between 2004 and 2006. Subsequently, there was an increase in revenue generated from the tourist industry in this time period, as illustrated in *Table 7.5 Revenue Generated by overseas tourists to Louth.*

Table 7.4: Overseas Tourism to Louth

Overseas Tourists	Total	Britain	M. Europe	N. America	Other Areas
2006	95, 000	53,000	25,000	9,000	8,000
2005	92,000	54,000	22,000	12,000	4,000
2004	87,000	51,000	21,000	11,000	4,000

Table 7.5: Revenue Generated by overseas tourists to Louth

Revenue Generated (€m)	Total	Britain	M. Europe	N. America	Other Areas
2006	37	17	13	6	1
2005	28	13	9	5	1
2004	24	11	5	7	1

Key tourism areas in close proximity to the development site include Dundalk, Tallanstown, Louth Village and Knockbridge offering pursuits including nature walks, fishing, golf and horse riding.

The development area is located approximately 800m south of a designated scenic route, (the R178 Carrickmacross to Dundalk road). However, it is not located in an Area of Outstanding Natural Beauty or an Area of High Scenic Beauty as designated by *Louth County Development Plan 2003 – 2009.*

7.3.10 Future Plans for the County

As described in Section 7.3.5 above, the proposed development is located in Development Control Zone 6 under the *Louth County Development Plan, 2003-2009.* It is an objective of the Development Plan to promote development that will sustain rural communities in the area. Small scale industries and public utility infrastructure are listed, amongst others, as appropriate forms of development within this control zone. The proposed development is in accordance with the provisions outlined in the *Louth County Development Plan, 2003-2009* in relation to development.

7.4 Impacts

7.4.1 Construction Phase Impacts

The construction phase is anticipated to extend to 30 months. The proposed development is expected to employ a maximum of 500 construction workers during the peak construction period which will run for 10 months whilst the average number of staff on site during the construction phase is estimated to be approximately 240 persons. This is a significant positive short-term impact for the local economy providing employment and also helping to alleviate the problems of unemployment experienced in County Louth as a whole.

The proposed development will potentially increase the population of the area during the construction phase of the development as it is likely that there will be an influx of construction workers to the area. Construction workers will positively impact on local businesses in nearby settlements which will provide them with services including accommodation, food and entertainment. This will create employment opportunities in the local service industry. This will be a significant positive short-term impact on the local economy.

Construction activities can cause a nuisance to the local community and result in disruption. However, the impacts, outlined below, will be short-term and will cease on completion of works:

- Possible disruption to services, commerce and the community as a whole as a result of potential disruptions to local services and utilities. It is considered however that the impact on local services will be largely positive as detailed above.
- Negative impacts on views at sensitive receptors surrounding the site due to construction works. Refer to *Chapter 5 Landscape and Visual*.
- Increased traffic and heavy goods vehicle movements during the construction phase will have a negative short-term impact on the local community, primarily due to potential traffic disruption on local roads. Refer to *Chapter 6 Roads and Traffic*.

- Impacts on local landowners in the area such as impacts on cattle movements. Farmers in the area use the local road network in order to gain access to their lands and also to move livestock. There is a potential for some short term negative impact on these operations.
- The construction phase will have a temporary negative impact on the local population as a result of noise, vibration and dust during working hours. Refer to *Chapter 8 Noise and Vibration* and *Chapter 9 Climate and Air Quality* for further information.

Overall, construction phase impacts are considered to be slight and temporary in nature in terms of any impact on the socio-economic environment.

7.4.2 Operational Phase Impacts

The proposed development will offer many positive benefits to the local community and economy. The two most important positive impacts are the employment opportunities that the proposed development offers and the improvement to public utilities which will result, (both local and national)

The impact in relation to employment during the operational phase is predicted to be positive with full time long-term employment available; in an area where such employment is scarce. The operational and maintenance staff will be sourced locally, where possible. Long term, there will be approximately 36 people working at the power plant made up of management, administration staff, maintenance and operational staff. The development will create an industrial employment base for this locality, which previously did not exist. The development will reduce unemployment in the area, which in the past has proven to be a consistent problem for the county.

The power plant will provide a significant positive impact on the national economy during the operational phase of the development by improving the public utilities infrastructure and generating additional much needed electricity.

In addition, it is proposed that a new link road will be developed between the local Stonetown road and the R178 to the north. As the current junction at Ballakelly Crossroads is recognised as being unsafe this new link road will have a significant long-term positive impact on the local road infrastructure.

The overall impact of the proposed development on the socio-economic environment during the operational phase is considered positive.

7.5 Mitigation Measures

7.5.1 Construction Phase

In order to control potential negative impacts during construction a Construction Environmental Management Plan (CEMP) will be developed and implemented by the nominated Contractor during the construction phase of the project. The plan will include a Dust Minimisation Plan, a Traffic Management Plan and a Waste Management Plan.

Specific mitigation measures include:

- Connection to services will be carried out during low demand periods in order to minimise any potential disruption to services in the area.

- Use of artificial lighting will be restricted to the minimum required for safety and security.
- Large plant will be located as far as possible from local residences to minimise the visual impact of construction activities.
- A link road will be constructed to the R178. This will minimise the impact of construction and operation phase traffic on local roads, including cattle movements.

Following the implementation of mitigation measures as detailed for the construction phase the impact of the proposed development is not considered to be significant.

7.5.2 Operational Phase

It is not anticipated that any mitigation is required regarding the socio-economic context discussed above.

Other relevant mitigation measures relating to Landscape and Visual Impact, Noise and Vibration, Air Quality and Water are discussed in Chapters 5, Chapter 8 and Chapter 9 and Chapter 12 respectively.

7.6 Residual Impacts

Residual impacts are those that could arise as a result of the operation of the electricity generating plant once the proposed mitigation measures are in place. The residual impact of the proposed development will be significant, positive and long-term due to the provision of long-term employment opportunities and improved infrastructure.

7.7 Summary Conclusion

Up to 500 construction workers will be employed on site during the construction phase resulting in a significant short-term positive impact for the local economy providing both direct and secondary employment opportunities. The influx of construction workers to the area will positively impact on local businesses which will provide them with services including accommodation, food and entertainment. The supply of services and supplies to the site will also have a positive impact on the local economy. The proposed development will lead to the creation of 36 permanent jobs comprising management, operators, technicians and administrative personnel.

Water will be provided to the site via the Killany-Reaghstown Group Water Scheme. Gas will be provided from the BGN via a new gas pipline to the area. Connection to the substation will be via an underground cable. Service connections will be carried out at low demand periods in order to minimise disruption to local supplies.

It is considered that the overall impact from a socio-economic perspective will be positive.

8 Noise and Vibration

8.1 Introduction

This section of the EIS evaluates the potential noise and vibration impacts arising from the construction and operation of the proposed power plant. Criteria against which predicted noise and vibration levels are assessed have been derived from recognised national and international guidance. The relevant guidance is referenced throughout this assessment report. Where noise and vibration predictions show a potential for significant impacts, possible mitigation measures are set out. Any residual impacts remaining after mitigation has been applied are described.

The assessment includes:

- a baseline noise survey, and description of the existing noise environment;
- development of criteria to set acceptable noise levels at sensitive receptors for both construction and operation;
- prediction of noise levels for construction and operational phases; and
- an evaluation of the effects of noise during both construction and operation.

8.2 Noise Sensitive Receptors

A noise sensitive receptor is identified as a location where significant changes in environmental noise levels have potential to cause either detrimental or beneficial effects. Considered effects typically include influence to the amenity of an area, potential disturbance to sleep, comfortable conversation or entertainment, degradation of an educational environment, or interruption of a religious ceremony. Noise sensitive receptors in the vicinity of the proposed CCGT power plant at Toomes have principally been selected according to the likelihood of the effects listed above to occur, and also where necessary to represent a group of locations, on a 'worst-case' basis, where similar effects may occur.

Potential noise impacts to the natural environment of an area will be treated qualitatively, where necessary, due to the absence of comprehensive literature or guidance on the topic.

The area around the proposed power plant is primarily pastoral farmland, punctuated by scattered residences, farmhouses, and a couple of small hamlets. Seven noise sensitive receptors were selected from these residences, within approximately 1 kilometre of the development site, in order to comprehensively assess the potential noise impacts from the proposed power plant. One school has been identified in the area, on Stonetown Road. Stonetown National School is over 1 kilometre from the development site, and is not considered sensitive to noise from construction or operation of the power plant. No further especially sensitive receptors were identified.

The identified receptors are listed in *Table 8.1* below, together with a discussion of the current (baseline) noise environment in *Section 8.5.2*.

8.3 Noise Sensitive Locations

8.4 Methodology and Assessment Criteria

Establishment of methodologies and assessment criteria relevant to baseline conditions, construction and operation of the scheme are discussed in the appropriate sections below.

Construction works will produce some ground vibration, with the possibility of driven piles for some foundations on the main plant. Vibrating rollers may also be used for compaction of ground and stone layers. However, vibration has not been considered in detail since no major sources of vibration are expected to be within 100m of the nearest sensitive receptor, during either construction or operation. Consequently, vibration will not be a significant issue, and has not been considered further.

8.5 Existing Noise Environment

8.5.1 Baseline Noise Surveys

An important consideration in assessing the noise impact of any proposal is the change in ambient noise levels that it produces at noise sensitive receptors. Baseline noise surveys have been carried out accordingly, close to potentially affected receptors, to determine existing noise levels. During the surveys, a series of 10 minute samples of ambient noise were measured at positions adjacent to the chosen receptors in accordance with *British Standard (BS) 7445: Description and Measurement of Environmental Noise, Part 1, Guide to quantities and procedures (1991).*

Monitoring was undertaken on the 16th, 17th and 18th of May 2007. The monitoring locations are identified in *Figure 8.1*. A description of the monitoring locations is provided in *Table 8.1* and a summary of the results of the monitoring are presented in *Table 8.2*. Details of this baseline noise survey can be found in *Appendix 8.1*

Noise measurements were carried out using a B&K 2260 Class 1 Sound Level Meter, which was calibrated before, during and after the survey period. Weather conditions for the survey were varied, with intermittent rain on the 16th, and increasing winds on the 18th. However, measurements were only undertaken during calm, dry periods, and any measurements influenced by wind or rain have been noted and disregarded.

Table 8.1: Description of Monitoring Locations

Ref.	Description
1	Three residential farmhouse properties are located in this wooded area, approximately 800 metres from the proposed development. The area is quiet, with occasional traffic on Stonetown Road audible, and noise from birds being dominant.
2	One residential farmhouse is located here, approximately 250 metres from the proposed power station site. Ambient noise levels are very low, with no dominant sources. Cars on the road from Louth are occasionally audible.
3	A number of farmhouse residences are located at the end of the laneway, 500-700 metres from the proposed development. Ambient noise levels are very low. Farm machinery is occasionally audible.
4	A number of residences are located on this road which links Louth and Corcreeghagh, approximately 600 metres from the proposed development. Ambient noise levels are low, and influenced by intermittent traffic.
5	One residential farmhouse is located at the end of a long drive, approximately 700 metres from the proposed power station site. Ambient noise levels are very low. Vehicles travelling on the road between Louth and Corcreeghagh are occasionally audible.
6	One residential farmhouse is located on this section of laneway, approximately 400 metres from the proposed power station site. Ambient noise levels are very low. A low frequency buzz from the nearby power lines is audible at this location.
7	A small number of residences are located on Stonetown Road in the vicinity of the proposed development. Background noise levels are low, although equivalent ambient levels are influenced by intermittent traffic on Stonetown Road, and by more regular traffic on the R178.

8.5.2 Description of the Existing Noise Environment

As described in the above table, the area around the proposed development is predominantly rural, and ambient noise levels are very low. The largest road through the area is the R178, but this is reasonably distant from the development site, and only makes a small contribution to noise levels to the north of the site. Introduction of a new industrial noise source could be expected to change the character of ambient noise in the vicinity of the development.

A summary of measured noise levels is shown in *Table 8.2* below.

Table 8.2: Baseline Noise Level Summary

NML	Lowest Measured Daytime 0800 – 2200 (dB)		Measured Night-time Range 2200 – 0800 (dB)		Measured L_{AFmax} Range (dB)
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	
1	47	40	39	36	55 – 64
2	38	33	32	28	48 – 69
3	37	31	31	25	51 – 60
4	36	30	34	29	53 – 79
5	40	28	30	25	50 – 74
6	31	27	31	27	49 – 53
7	35	28	35	27	51 – 83

8.6 Assessment Criteria

8.6.1 Proposed Noise Criteria

The operation of combustion installations with a rated thermal input equal to or greater than 50MW requires an IPPC licence from the Environmental Protection Agency (EPA) to operate. Noise guidance has been issued by the EPA, *Guidance Note for Noise in Relation to Scheduled Activities, 2nd Edition, 2006*, which suggests that daytime (08:00 – 22:00) and night-time (22:00 – 08:00) noise levels should not exceed the levels below at noise sensitive locations:

- Daytime LAr,T 55dB(A) free-field
- Night-time LAeq,T 45dB(A) free-field

However, this guidance also recommends that in quiet areas, where background levels are 'very low' (below approximately 35 dB), lower noise limits may be more appropriate. As described in *Section 8.5.2* above, background noise levels at receptors 2-7 fall below 35 dB. *British Standard 4142, Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas, (BSI,1997)* is referred to in the EPA guidance for the method of determining the rating level of an industrial noise source, and is also appropriate for establishing assessment criteria and subsequent noise limits.

This standard recommends comparison of existing environmental noise levels with predicted operational plant noise levels, in terms of the calculated rating level. Calculation of the rating level includes an additional penalty, in dB, to account for any particular intrusive character of the introduced noise. The comparison supplies a means of forecasting the reaction of the public in exposure to introduced industrial noise.

An exceedance of background (L_{A90}) levels of 5 dB is considered to be marginal, while complaints are considered likely where the noise rating level exceeds the background by 10 dB or more. If the assessment shows that the noise generated by the operation of fixed plant is more than 'marginal', as defined by *BS 4142*, at a noise sensitive receptor then this is assessed as a significant effect. As such, it will be preferable to design the plant (specific noise level – $L_{Aeq, T}$) to a level that is no more than around 5 dB above the background noise, to avoid any effect considered more than marginal. The standard requires that daytime assessments are based on the highest L_{Aeq} from the noise source over a period of one hour, while at night an assessment period of five minutes is specified.

The baseline survey revealed that the minimum background noise level at 6 of the 7 receptors was less than or equal to 30 dB L_{A90}. *BS 4142* suggests, similarly to the EPA guidance, that background noise levels below about 30 dB are considered to be very low. For this reason, *BS 4142* can be interpreted as advising that 30 dB is a lower limit of baseline for comparing with plant noise levels. In these cases, if the proposed development is designed so that specific plant noise is equal to or less than 35 dB L_{Aeq} at receptors, then significant noise impacts will be avoided. Where background levels are not very low, but fall below the general night-time limit of 45 dB a level 5 dB above lowest measured background will apply, as at Receptor 1.

These impact assessment criteria, and noise limits, for each receptor are listed in *Table 8.3*. As the power plant is proposed to operate 24 hours a day, the night-time period and lower noise limits will be most critical to the assessment.

Table 8.3: Noise Assessment Criteria

Receptor	Background Noise Level	Background Level + 5dB	Impact Assessment Criterion
1	36	41	41
2	28	33	35
3	25	30	35
4	29	34	35
5	25	30	35
6	27	32	35
7	27	32	35

A further indication of the appropriateness of these assessment criteria can be gained by referring to the *Wind Development Guidelines, Department of the Environment, Heritage and Local Government, 2006.* These planning guidelines suggest that in low noise environments (background noise less than 30 dB), the daytime level of the development noise should be limited to an absolute level within the range 35-40 dB ($L_{A90,\ 10\ min}$) i.e.

"*in very quiet areas, the use of a margin of 5dB(A) above background noise at nearby noise sensitive properties is not necessary to offer a reasonable degree of protection and may unduly restrict wind energy developments which should be recognised as having wider national and global benefits".*

In addition these guidelines state that:

"during the night the protection of external amenity becomes less important and the emphasis should be on preventing sleep disturbance. A fixed limit of 43 dB (A) will protect sleep inside properties at night."

Due to the difference in noise emission character between a wind energy development and the proposed power plant, these guidelines have not been used to establish the assessment criteria, but provide a useful indication of an acceptable range.

The operation of the plant will result in infrequent venting of gas during any incidents which cause shutdown of plant items. This may cause unexpected increases in noise emissions but such events will be very infrequent, probably only occurring once a year on average, and therefore the noise impact of such venting operations are considered negligible.

Any transport noise effects resulting from the operation of the proposed project would be permanent. Appropriate guidance for prediction and assessment of road traffic noise can be found in the NRA Guidelines. In general, if road traffic noise is increased by at least 3 dB due to transport noise, then the resultant effect has been reported as significant.

8.7 Noise Mitigation Assessment

8.7.1 Noise Propagation Model

Propagation of noise from operation of the proposed power plant was predicted using the proprietary modelling software SoundPlan. Noise predictions were made using this software according to guidelines specified in *British Standard 5228, Noise and Vibration Control on Construction and Open Sites, BSi, 1997* and also according to *ISO 9613-2 ISO 9613-2: Attenuation of Sound Propogation Outdoors: General Method of Calculation, International Organisation for Standardisation, 1996.* This methodology considers the strength and size of the noise source(s), screening effects due to local topography and intervening buildings, dispersion of sound energy over distance, and attenuation due to ground and air absorption. Meteorological conditions, in the form of average wind speed and direction have also been incorporated

Topographical data for the area of the development has been supplied digitally by Mott Mac Donald Pettit (MMP), in the form of elevation contours and spot-heights, for an area with radius of approximately 1 kilometre around the development site. Information on the site layout for the power plant and auxiliary buildings was also obtained from MMP drawings as well as supplementary sketches of individual plant items.

Noise source strengths for the power plant items for the steady-state operation of the facility are summarised in *Appendix 8.2.* In the absence of sound power levels for individual equipment, noise levels within plant buildings can be assumed not to exceed a spatially averaged sound pressure level of 85 dB(A), for the purposes of maintaining a safe working environment according to the *EU Physical Agents Directive, 2003/10/EC.* An estimate has been made of the acoustic performance of the building shell, assuming it is of single sheet steel construction, based upon previous experience and published data. Octave band transmission loss values for this typical building cladding are shown in *Table 8.4* below.

Table 8.4: Octave Band Transmission Loss Assumed for Building Cladding

Freq (Hz)	31	63	125	250	500	1k	2k	4k	8k
Transmission Loss	1	4	10	15	19	24	25	30	30

As the area surrounding the development site consists primarily of fields and vegetation, soft ground attenuation has been included for all predictions of noise at receptors.

The EPA guidelines and *BS 4142* suggest the addition of a penalty to the predicted plant noise level, to determine the 'rating level', if the introduced noise is thought to exhibit an intrusive quality. Situations where this is warranted include:

- where the noise contains a distinguishable, discrete continuous note (whine, hiss, screech, hum);
- where the noise contains distinct impulses (bangs, clicks, clatters, or thumps);

- where the noise is irregular enough to attract attention; and
- where the level in one 1/3rd octave band is 5 dB (or more) higher than the level in the two adjacent bands and the tonal components are clearly audible.

Noise from operations of the proposed power plant is not expected to normally exhibit these characteristics. As such, the noise rating level is equivalent to the predicted plant noise, or specific noise level.

8.8 Noise Impact Assessment during the Operational Phase

Incorporation of the above information into a noise model has enabled predictions of operational noise levels at receptors to be made. Additionally, predicted operational noise contours have been produced to give an indication of the contribution of the power plant to environmental levels. *Table 8.5* summarises the predicted noise levels at receptors, and the expected exceedance of the relevant impact criteria. *Appendix 8.3* shows the predicted noise contours at 4.3m above ground level.

Table 8.5: Operational Noise Levels at Receptors

Receptor	Predicted Level ($L_{Ar,T}$ dB)	Exceedance of Noise Criterion (dB)
1	36	-
2	48	13
3	40	5
4	44	9
5	38	3
6	42	7
7	38	3

Exceedance of noise assessment criterion is predicted at all locations, with the exception of Receptor 1. The greatest exceedance is predicted at Receptor 2, which is approximately 250 metres from the centre of the development site. The predicted rating level (equivalent to plant noise level) exceeds the night-time assessment criterion by 13dB and a substantial detrimental effect on the environmental noise climate is predicted.

At three other receptors (3, 4 and 6), the night-time assessment criteria is exceeded by 5, 9 and 7 dB respectively, which indicates significant impacts are predicted.

8.8.1 Operational Road Traffic Noise

Prediction of road noise levels due to operation road traffic has been undertaken using methodology found in the National Roads Authority's Guidelines *for the Treatment of noise and vibration in National Road Schemes, 2004*. Once operational, an average of approximately 76 vehicles per day, personal and heavy goods vehicles are expected to access the site. On the local roads, and on the access lane, this number of vehicles is not predicted to significantly increase the overall noise levels ($L_{10,\ 18hr}$ or L_{den}).

As an introduced noise source, individual traffic using the access road is likely to be audible above the low background noise levels. The closest receptor (Receptor 2) is approximately 250 metres away from the access road, at which distance the passing of a heavy goods vehicle, is not likely to be differentiated from other occasional noise events (L_{Amax}) of the existing noise environment. As such, no significant impacts are predicted as a result of operational road traffic.

8.9 Construction Phase Noise Impact

8.9.1 Construction Phase Noise Criteria

The construction phase of a development is often the period over which any potential for noise impact is greatest. There are difficulties in applying the same noise control measures to temporary construction activities as are applied to fixed and permanent installations or operations. The reasons for this are as follows:

- for construction work, noise control measures can be restrictive and could unreasonably prolong the site works and construction programme;
- works areas are not fixed and change according to the demands of the construction work;
- work, in the initial stages at least, is conducted out of doors without the benefits of fixed plant houses; and
- mobile plant is used which limits the scope for noise control measures.

Advice and guidelines to local planning authorities and developers in the UK can be found in the following:

- Planning Policy Guidance Note PPG 24, *Planning and Noise, DoE 1994;*
- British Standard BS 5228: Noise and Vibration Control on Construction and Open Sites. Code of practice for basic information and procedures for noise and vibration control, (1997)
- Department of the Environment (DoE), *Advisory Leaflet 72 (1976) Noise control on building sites, DoE*

Advisory Leaflet 72 is out of print, but remains as a paper giving guidance on acceptable levels of noise. PPG24 refers to the guidance in BS 5228 in respect of construction noise. These guidelines are considered as transferable and appropriate for construction projects in the Republic of Ireland.

DoE Advisory Leaflet (AL) 72 gives advice as to maximum levels of construction site noise at residential locations during daytime hours (07:00-19:00). Since the criterion of speech interference forms the basis of the recommendations, they can be applied to commercial (office) buildings. The leaflet states that the noise level outside the nearest occupied room should not exceed:

- 75 dB(A) in urban areas near to main roads in heavy industrial areas; or
- 70 dB(A) in rural, suburban and urban areas away from main road traffic and industrial noise.

These levels are generally taken as being facade L_{Aeq}. AL72 also suggests that in the evening period a level of 10 dB(A) below that during the day may be appropriate. Although BS 5228 does not propose noise criteria for daytime, it suggests that acceptable noise levels in the evening (19:00-23:00 hours) may need to be 10 dB (A) lower than daytime levels. The daytime assessment criteria which are used for evaluating the significance of construction noise are based on criteria set out in the UK *Department of the Environment (DoE) Advisory Leaflet 72*.

A summary of the relevant criteria for the assessment of the effects of construction noise is set out in *Table 8.6.* The noise levels set out in *Table 8.6* are not aimed at providing noise limits for construction activities, but are the threshold criteria used for the assessment of construction noise effects.

Table 8.6: Threshold Criteria for Evaluating the Effects of Noise during Construction

Period	Building/Location	Criteria for Assessment $L_{Aeq, period}$	Purpose
Daytime (0700 – 1900)	Dwellings/Offices (façade)	70 dB	To maintain speech intelligibility
	Schools	65 dB	To maintain speech intelligibility in classrooms
Evening (1900 – 2300)	Dwellings (façade)	60 dB (1)	To avoid sleep disturbance
Night-time (2300 – 0700)	Dwellings (façade)	45 dB (2)	To avoid sleep disturbance

(1) Although BS5228 does not propose noise criteria for daytime periods, it suggests that acceptable noise levels in the evening may need to be 10 dB(A) lower than daytime levels. For the purpose of this assessment, the evening has been defined as 1900 to 2300 hours.

(2) or equal to ambient L_{Aeq} levels if the ambient noise level is higher than 45 dB

The above criteria are based on ERM's experience of standard practice on a wide range of projects. The approach that has been adopted in the assessment to determine the potential noise effect from construction activities compares predicted noise levels for each construction phase with the noise criteria in *Table 8.6.* In cases where predictions show that these criteria will be exceeded for at least a few days, a significant potential effect has been reported. Where possible, noise measurements from similar construction activities are used to inform this assessment.

Increases in road traffic noise of 3 dB(A) or more have been considered potentially significant for construction traffic. NRA guidelines supply a preferred methodology for prediction and assessment of noise from construction traffic.

8.9.2 Construction Phase Noise Prediction Methodology

Noise levels are predicted using the methods set out in *British Standard 5228*. Predictions are made based on indicative plant teams representing the noisiest phases of the works.

For specific construction activities the exact plant details will be developed during the detailed design stage. However, an indicative assessment has been undertaken by assuming a general plant team based upon experience of the activities required. Construction noise has been predicted for three 'worst-case' situations, considered as snap-shots of concurrent construction activities where numerous construction plant items for multiple activities are operating simultaneously. Information on the expected construction schedule and phasing can be found in *Section 3.9*, which has been used to develop the plant teams used for noise predictions. Construction plant teams associated with relevant activities are summarised in *Appendix 8.4*.

Predictions have been undertaken using the proprietary modelling software SoundPlan. Together with associated sound power levels for construction plant equipment, equivalent noise levels at receptors will also depend upon the expected percentage of usage or on-time, distance from the source, air and ground absorption, and any potential screening from buildings or topography. Location of construction equipment within the site for the noise assessment is based upon assumption of a typical case, where plants items are located arbitrarily, unless associated with a location-specific activity.

8.9.3 Construction Phase Impacts and Mitigation

Three scenarios, each considering three concurrent construction activities, have been modelled and assessed. A summary of these three scenarios is shown below in *Table 8.7*.

Table 8.7: Construction Scenarios

Construction Scenario	Concurrent Activities
1	Construction of Access Road Site Clearance Grading
2	Excavation Piling (Driven and Bored) Pouring Foundations
3	Backfilling Excavation Structural Steelwork

Noise levels for these three 'worst-case' scenarios have been predicted at receptors, and are shown below in *Table 8.8,* together with the highest predicted exceedance of the relevant assessment criteria for all scenarios. Normal working hours during the construction period are expected to be Monday to Friday 0800 – 2000 and Saturday 0800 – 1700. Most of this work thus falls into the daytime noise assessment category. An hour of the daily duration of construction activities falls into the evening assessment period, and as such predicted noise levels have also been compared with this criterion. No night-time works are scheduled for the construction phase.

Table 8.8: Predicted Unmitigated Construction Noise Levels

Receptor	Predicted Noise Level for Construction Scenario ($L_{Aeq,T}$ dB, facade)			Exceedance of Daytime Construction Noise Criterion (dB)	Exceedance of Evening Construction Noise Criterion (dB)
	1	2	3		
1	52	53	50	-	-
2	61	65	63	-	5
3	54	56	54	-	-
4	55	60	54	-	-
5	51	57	50	-	-
6	54	58	52	-	-
7	53	55	51	-	-

Table 8.8 indicates that no exceedance of the day-time construction noise assessment criterion ($L_{Aeq,T}$ 70 dB) is predicted at any receptor, and consequently no daytime noise impacts are expected.

For one hour of the evening where construction falls into the evening assessment period, exceedance of the criterion ($L_{Aeq,T}$ 60 dB) is predicted at Receptor 2 for all scenarios considered. The maximum exceedance of the evening criterion at this receptor is 5 dB during Scenario 2, which includes excavation, piling and foundation works. However, the short duration of this predicted exceedence, in the first hour of the evening, is not expected to result in a significant noise impact. Additionally, the following mitigation, applied as standard good practice for construction, is predicted to reduce noise levels to below 60 dB. This mitigation consists of ensuring that:

- plant will be used in an appropriate manner with respect to minimising noise emissions;
- inherently quiet plant will be selected where appropriate;
- local screening is used wherever practical;
- noisy plant will be located as far as possible from sensitive receptors; and
- construction contractors will be required to adhere to the codes of practice for construction working and piling provided in British Standard BS 5228, and the guidance given therein, for minimising noise emissions from the site.

Construction is likely to be audible in the vicinity of the development, as the area has particularly low background noise levels, although due to the temporary and transient nature of works, this will not result in any significant impacts.

8.9.4 Construction Traffic

Prediction of road noise levels due to construction traffic has been undertaken using methodology found in the NRA guidelines. During the construction phase, the number of vehicles accessing the site per day is expected to reach a peak of 14. On the local roads, and on the access lane, this number of vehicles is not predicted to significantly increase the overall noise levels ($L_{10,\ 18hr}$ or L_{den}).

As an introduced noise source, construction traffic using the access road is likely to be audible above the low background noise levels. However, the closest receptor (Receptor 2) is approximately 250 metres away from the access road, at which distance the passing of a vehicle, assumed to have a sound power level of 105 dB, will not have a significant impact. As such, no significant impacts are predicted as a result of construction traffic.

8.10 Mitigation of Operational Noise

As outlined in *Section 8.5.2*, noise impacts due to power plant operations are predicted at receptors 2 – 6. The power plant consists of numerous items, some external, which contribute to environmental noise levels. As such, treating these multiple noise sources needs to be carried out in a piece-wise basis in order to achieve acceptable levels at receptors. *Table 8.9* below lists the 10 power plant components making the greatest contribution to the total noise level predicted at Receptor 2.

Table 8.9: Plant Noise Contributions at Receptor 2

Power Plant Component	Associated Noise Level at Receptor ($L_{Ar,T}$ dB)
Turbine Hall (South Façade)	43
Fuel Pump	41
Fin Fan Cooler Outlet	39
Turbine Hall (Roof)	38
Air Cooled Condenser Outlet	36
Turbine Hall (West Façade)	35
HRSG (South Façade)	32
Turbine Hall (East Façade)	31
Stack	30
HRSG (West Façade)	30

The above table indicates that treatment of noise sources to achieve acceptable levels at Receptor 2 should be focused on the Turbine Hall, Fuel Pump, Fin Fan Cooler, Air Cooled Condenser and HRSG (Heat Recovery Steam Generator) Building. Similar assessment for other receptors indicated that the Gas Turbine Filter House (air inlet) also makes a significant contribution to environmental noise levels. Detailed design of the power plant is yet to be undertaken, and the following measures are considered appropriate in application of Best Available Techniques for mitigation of noise:

1. Improvement of the performance of the building shell (cladding) of the Turbine Hall, from that specified in *Table 8.4*, to that specified in *Table 8.10* below;

2. Similarly, improvement of the performance of the building shell (cladding) of the HRSG Building, from that specified in *Table 8.4*, to that specified in *Table 8.10* below;

3. Location of the Fuel Pump (Fuel Oil Systems) in an enclosure;

4. Specification of the selected Fin Fan Cooler (through variation of speed, size and profile of the outlet fans) to achieve a minimum reduction in sound power level of 5 dB;

5. Specification of the selected Air Cooled Condenser (through variation of speed, size and profile of the outlet fans) to achieve a minimum reduction in sound power level of 5 dB; and

6. Addition of an inlet acoustic louvre system for the Gas Turbine Filter House.

These measures are considered likely to be practical and efficient for achieving reduced noise levels at this stage of the design.

Table 8.10: Minimum Octave Band Transmission Loss Proposed for Construction of the Turbine Hall and HRSG Building Walls and Roof (typical 75mm acoustic panel, or equivalent)

Freq (Hz)	63	125	250	500	1k	2k	4k	8k
Transmission Loss	15	22	32	38	45	43	40	40

Incorporation of mitigation measures 1 – 6 into the noise model has enabled mitigated levels to be predicted, for a situation considering an improved building shell, enclosure of the fuel pump, and modification of the Fin Fan Cooler and Air Cooled Condenser. Results of these predictions for a partly mitigated situation are summarised below in *Table 8.11*. However, design of appropriate mitigation for the Gas Turbine Filter House (inlet acoustic louvre system) if necessary will require further investigation and depend upon details of the required operation, and has not been included in predictions for a mitigated operational noise scenario.

8.11 Residual Noise Impact

Noise levels at receptors during operation of the proposed power plant, for the situation where mitigation measures 1 - 6, as outlined in *Section 8.10* above, are incorporated have been predicted and are shown below in *Table 8.11*.

Table 8.11: Residual Noise Levels at Receptors

Receptor	**Noise Rating Level (equivalent to specific plant noise) at Receptor ($L_{Ar,T}$ dB)**	**Exceedance of Noise Criterion (dB)**
1	32	None
2	39	4
3	31	None
4	36	1
5	32	None
6	37	2
7	35	None

The above table indicates that exceedance of the operational noise assessment criteria with incorporation of mitigation measures (high performance building cladding to the Turbine Hall and HRSG Building, containment of the Fuel Pump in an enclosure, and modification of the design of the Fin Fan Cooler and Air Cooled Condenser) is predicted at 3 of the 7 receptors.

The greatest exceedance, 4 dB, is predicted at Receptor 2. This, and the levels at Receptors 4 and 6, imply that the proposed development will make a small but noticeable change to the noise environment in the area. However, application of the mitigation measures specified above is considered by ERM as satisfying the requirements of Best Available Techniques for reducing environmental noise to a reasonable level. Additionally, the predicted noise level is below that proposed by the *Wind Development Guidelines*, as outlined in *Section 8.6* to protect sleep inside properties at night (43 dBA), and within the 35-40 dB daytime L_{A90} level proposed for very quiet areas.

8.12 Summary Conclusion

Seven noise sensitive receptors were selected within approximately 1 kilometre of the proposed site in order to comprehensively assess the potential noise impacts from the proposed power plant. Day and nightime baseline noise surveys determined that the background noise levels in proximity to the proposed development are considered to be very low, (i.e. less than 30 dB). The noise impacts were thus assessed in accordance with guidelines appropriate to very quiet areas. In accordance with the guidelines an exceedance of background levels of 5 dB is considered to be marginal, while complaints are considered likely where the noise level exceeds the background by 10 dB or more.

With the implementation of noise mitigation measures, (including improvements to the building shell of the main turbine hall and HRSG, enclosure of fuel pumps, addition of an inlet louver system to the Gas Turbine Filter House and modification of fan coolers and air cooled condenser) the resultant noise levels range from 31 dB to 39 dB. These levels predict a small but noticeable change to the noise environment at three of the seven receptors selected. However, the change is considered to be within acceptable levels satisfying the requirements of relevant guidelines for very quiet areas through the implementation of best available techniques.

During the construction phase it is anticipated that there will no exceedence of day time construction noise assessment guidelines. However, if a "worst-case scenario" combination of construction activities occurs on site during the evening period it is anticipated that the evening criteria guidelines may be exceeded. This can be mitigated against by planned construction activities ensuring that the noisiest activities are conducted outside of evening hours.

Construction activities are likely to be audible in the vicinity of the development, as the area has particularly low background noise levels. However, due to the temporary and transient nature of works and the distance to the nearest sensitive receptors the impact is not considered to be significant.

9 Climate and Air Quality

9.1 Introduction

This chapter of the Environmental Impact Statement (EIS) describes the Climate and Air Quality in the existing environment within and surrounding the proposed development site. The chapter is divided into the following sub-sections:

9.2 Climate

9.2.1 Introduction

9.2.2 Methodology

9.2.3 Existing Environment

- Macro-climate
- Micro-climate

9.2.3 Environmental Impacts

9.2.4 Mitigation Measures

9.3 Air Quality

9.4 Operational Phase Impacts

9.5 Construction Phase Impacts

9.6 Mitigation Measures

9.7 Summary Conclusion

9.2 Climate

9.2.1 Introduction

This section of the Climate and Air Quality Chapter identifies, describes and assesses the impact of the proposed power plant on the climate of the surrounding area and the effect the development will have on greenhouse gases. The information obtained is based on a desk-top study of both macro and micro climatic features.

9.2.2 Methodology

The methodology employed to describe the current climate of the study area entailed undertaking a desk study assessment on relevant available data from Met Eireann.

9.2.3 Existing Environment

(i) Macro climate

Macro climate is the climate of a large geographical area or country. Ireland's climate is influenced by the warm waters of the Gulf Stream, and is in the path of the prevailing southwesterly winds coming from the Atlantic Ocean. Accordingly, Ireland does not suffer from temperature extremes experienced by many other countries at similar latitude. The average annual temperature is about 9 °C.

Annual mean wind speed varies between about 4 metres per second and 7 metres per second and average rainfall varies between 800 and 2 800 millimetres. Ireland normally receives between 1400 and 1700 hours of sunshine each year, with sunshine duration being highest in the southeast of the country. Ireland's geographical position off the northwest of Europe close to the path of Atlantic low pressure systems tends to maintain the country in humid, cloudy airflows for much of the time.

(ii) Micro Climate

Louth is bounded on the east by the Irish Sea, on the west by the counties of Monaghan and Meath, on the south by County Meath and on the north by Carlingford Bay and County Armagh. The development site is located in a low-lying area surrounded by undulating hills, within the Louth Drumlin and Lake Character Area as classified by *Landscape Character Assessment of County Louth, (Louth County Development Plan 2003-2009, published by Louth County Council).*

Synoptic stations observe and record all surface meteorological data. These observations include temperature, relative humidity, sunshine, rainfall, wind and general weather. There are 15 such synoptic stations located in Ireland. The nearest station to the proposed development is Dublin Airport, located 71 metres per second above sea level approximately 60 kilometres to the south east of the development site. Climatic recordings at Dublin Airport would be indicative of Co. Louth. *Table 9.1* represents 30 year monthly and annual mean and extreme values recorded at Dublin Airport.

Table 9.1: Climatic Observations for Dublin Airport, (1961 – 1990)

I961- 1990													
Temperature	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Mean daily max	7.6	7.5	9.5	11.4	14.2	17.2	18.9	18.6	16.6	13.7	9.8	8.4	12.8
Mean daily min	2.5	2.5	3.1	4.4	6.8	9.6	11.4	11.1	9.6	7.6	4.2	3.4	6.4
Mean	5.0	5.0	6.3	7.9	10.5	13.4	15.1	14.9	13.1	10.6	7.0	5.9	9.6
Absolute max	16.6	15.3	21.3	20.5	23.4	25.1	27.6	28.7	23.9	21.2	18.0	16.2	28.7
Absolute min	-9.4	-6.2	-6.7	-3.7	-1.0	1.5	4.8	4.1	1.7	-0.6	-3.4	-	-10.1
Mean no. of days with air frost	6.4	4.9	3.3	1.4	0.2	0.0	0.0	0.0	0.0	0.1	3.3	4.8	24.3
Mean no of days with ground frost	14.0	12.7	12.4	9.2	2.9	0.2	0.0	0.0	0.6	2.3	9.7	12.5	76.4
Relative Humidity %													
Mean at 0900 UTC	86	84	82	79	76	76	78	81	82	85	86	86	82
Mean at 1500 UTC	79	75	70	68	67	68	68	70	70	75	78	81	72
Sunshine (hours)													
Mean daily duration	1.8	2.5	3.6	5.2	6.1	6.0	5.4	5.1	4.3	3.1	2.4	1.7	3.9
Greatest daily duration	8.0	9.2	11.9	13.8	15.4	15.9	15.4	14.5	12.4	10.4	8.5	6.9	15.9
Mean no. of days with no sun	11	8	5	3	2	2	1	2	3	6	8	11	61
Rainfall (mm)													
Mean monthly total	69.4	50.4	53.8	50.7	55.1	56.0	49.9	70.5	66.7	69.7	64.7	75.6	732.7
Greatest daily total	30.3	31.3	35.7	26.2	30.0	46.6	34.8	60.2	40.9	47.5	55.1	41.7	60.2
Mean no of days with >= 0.2mm	18	14	16	14	16	14	13	15	15	16	16	18	185
Mean no of days with >= 1.0mm	13	10	11	10	11	10	9	11	10	11	11	12	128
Mean no of days with >= 5.0mm	5	3	3	3	4	4	3	4	4	4	4	5	48
Wind (knots)													
Mean monthly speed	12.2	11.7	11.6	9.7	8.7	8.0	8.1	8.0	8.9	9.9	10.8	11.8	9.9
Max gust	75	73	61	60	58	55	54	56	64	73	64	71	75
Max. mean 10-minute speed	48	49	42	41	39	36	34	41	35	45	43	47	49
Mean no of days with gales	2.1	1.1	1.2	0.3	0.3	0.1	0.0	0.3	0.3	0.5	0.7	1.4	8.2
Weather (mean no. of days with..)													
Snow or sleet	6.0	5.5	4.3	1.7	0.3	0.0	0.0	0.0	0.0	0.1	0.9	2.9	21.6
Snow lying at 0900 UTC	2.1	1.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	4.5
Hail	0.7	0.9	2.2	2.4	1.4	0.3	0.1	0.1	0.0	0.2	0.5	0.8	9.5
Thunder	0.1	0.1	0.2	0.3	0.6	0.7	0.7	0.6	0.3	0.3	0.1	0.1	4.1
Fog	4.8	4.3	3.9	4.5	3.6	3.1	3.6	5.3	4.9	4.7	4.0	3.9	50.5

Table 9.2 illustrates the amount of rainfall recorded at Dublin Airport from 2006 to August 2007. The table demonstrates that June and July of 2007 were the wettest months recorded during this time period.

Table 9.3 shows the mean temperatures recorded at Dublin Airport between 2006 and present. *Table 9.3* demonstrates that July and August were the warmest months on average this year.

Table 9.2: Total Rainfall (mm) Dublin Airport

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2007	73.2	77.8	38.8	14.7	35.0	126.4	126.5	53.5					545.9
2006	16.4	37.7	69.7	41.1	116.9	26.5	18.2	57.6	85.2	107.0	69.1	94.6	740.0
Mean	69.5	50.4	53.5	51.1	54.8	55.8	50.0	71.1	66.4	70.1	64.3	75.8	732.7

Note: All mean values calculated for the period 1961-1990

Table 9.3: Mean Temperature (degrees C) Dublin Airport

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2007	6.7	5.9	6.4	10.6	10.8	13.0	14.2	14.7					8.5
2006	5.6	5.0	5.5	8.0	10.8	14.6	16.9	15.2	14.7	11.6	7.6	6.6	10.2
Mean	5.0	5.0	6.3	7.9	10.5	13.4	15.1	14.9	13.1	10.6	7.0	5.9	9.6

Note: All mean values calculated for the period 1961-1990

Wind roses summarise the occurrence of winds at a location, showing their strength, direction and frequency. Wind at a particular location can be influenced by numerous factors including obstruction by buildings or trees, the nature of the terrain and deflection by nearby mountains or hills. Wind roses at Dublin Airport indicate that the prevailing wind direction is south to west. Wind strength recorded range from 3.09 metres per second to 10.80 metres per second with winds between 5.14 and 8.25 metres per second being most prevalent.

Greenhouse Gases

Increased levels of atmospheric greenhouse gases such as carbon dioxide (CO_2) enhance the natural greenhouse effect and cause climate change. Carbon dioxide arises from the burning of fossil fuels and land use changes. Under the Kyoto Agreement, Ireland has committed to limiting the increase of greenhouse gases to 13% above its 1990 levels, a limit that has to be reached during the period 2008–2012. The EU Council of Ministers has recently committed to achieving a 20% reduction in emissions of 1990 levels by 2020. Under the *Greenhouse Gas Emissions Trading Directive 2003/87/EC*, listed operators are allocated greenhouse gas emission allowances at the beginning of each year. If the operator does not meet their target they can buy or sell allowances within the EU. Combustion installations, such as the proposed development, with a rated thermal input exceeding 20 MW are included in the scheme.

9.2.4 Environmental Impacts

Construction and Operational Phase Impacts

- Due to the scale of the proposed development, during both the construction and operational phases of development, there are no predicted impacts on the macro and micro climate.
- The plant will release combustion gases through the burning of natural gas, and on rare occasions, diesel. However, as discussed in Section 9.3- Air Quality, maximum short-term and long-term impacts are considered to be of neutral significance.

9.2.5 Mitigation Measures

It is predicted that the proposed development will have no impacts on regional or local climate. Therefore, mitigation measures are not considered necessary.

9.3 Air Quality

9.3.1 Introduction

This section of the Climate and Air Quality Chapter presents the results of the air quality assessment and includes the following:

- Identification of assessment criteria;
- Assessment of existing air quality conditions in the study area;
- Identification of atmospheric emissions and key pollutants;
- Quantification of emission rates and evaluation with reference to relevant emission limits;
- Stack height determination;
- Dispersion modelling of key pollutant releases from the proposed power plant;
- Evaluation of the dispersion modelling results with reference to relevant air quality criteria;
- Qualitative assessment of potential air quality impacts associated with the construction phase; and
- Recommendations for further study or actions where necessary.

The proposed power plant will be designed to minimise atmospheric emissions using Best Available Techniques (BAT) and to ensure minimal air quality impacts from residual emissions by release through a stack of an appropriate height. The resulting potential effects to sensitive receptors have been assessed utilising dispersion modelling techniques in accordance with good practice.

9.3.2 Assessment Criteria

Overview

The operation of the proposed development will be governed by various EU air quality directives and Irish Air Quality Regulations. These are detailed below. Other pertinent environmental legislation includes the EU Large Combustion Plant Directive (2001/80/EC), and the Integrated Pollution Prevention and Control (IPPC) Directive, (96/61/EC). Compliance with the Large Combustion Plant Directive and the IPPC Directive will be addressed through operational permitting with the Environmental Protection Agency (EPA).

EU and Irish Air Quality Standards

EU Framework Directive 96/62/EEC on ambient air quality assessment and management came into force in November 1996 and had to be implemented by Member States by May 1998. The Directive aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants. As a Framework Directive it requires the Commission to propose "Daughter" Directives setting air quality objectives, limit values, alert thresholds and guidance on monitoring, siting and measurement for individual pollutants.

The Daughter Directive relevant to this assessment is Directive 1999/30/EEC relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air.

The Air Quality Standards (AQS) Regulations, 2002 (S.I. No. 271 of 2002) transposes the requirements of the EU Framework Directive and relevant Daughter Directives into Irish law.

Table 9.4 presents the air quality objectives and limit values for the pollutants relevant to this assessment as prescribed by the aforementioned EU and national Irish legislation.

Table 9.4: Irish Air Quality Standards (AQS) Regulations, 2002 (SI 271/2002)

Pollutant	Averaging Period	Objectives / Limit Values	Not to be exceeded more than[(c)]	Target Date
Oxides of Nitrogen (NO_x)	annual[(a)]	30 µg.m^{-3}	-	-
Nitrogen Dioxide (NO_2)	1 hour	200 µg.m^{-3}	> 18 times pcy	1st January 2010
	annual	40 µg.m^{-3}	-	1st January 2010
Sulphur Dioxide (SO_2)	1 hour	350 µg.m^{-3}	> 24 times pcy	1st January 2005
	24 hour	125 µg.m^{-3}	> 3 times pcy	-
	annual[(b)]	20 µg.m^{-3}	-	-

Note: (a) Limit value for the protection of vegetation
(b) Limit value for the protection of ecosystems
(c) pcy – per calendar year

Significance Criteria for Assessment

A number of approaches can be used to determine whether the potential air quality effects of a development are significant. However, there remains no universally recognised definition of what constitutes 'significance'. It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively. *Table 9.5* provides magnitude descriptors used for changes in Predicted Contributions as a percentage of the air quality limit value as a result of the proposed development.

Table 9.5: Magnitude Descriptors

Magnitude Descriptor	Predicted Contribution as % of Air Quality Limit Value
Very large	Increase/decrease > 25%
Large	Increase/decrease 15 - 25%
Medium	Increase/decrease 10 - 15%
Small	Increase/decrease 5 - 10%
Very Small	Increase/decrease 1-5%
Extremely Small	Increase/decrease < 1%

The magnitude descriptor identified must be considered in the context of existing air quality conditions within the study area in order for the significance of that magnitude to be determined. The most important aspects to consider are whether existing concentrations are above or below the relevant air quality limit value.

Table 9.6 provides descriptors for the significance of air quality effects based on the magnitude descriptors in the context of existing conditions. It should be recognised that professional judgement is required in the interpretation of air quality assessment significance. *Table 9.6 Descriptors for Effect significance* is intended as a tool to help interpret the results of the air quality assessment.

Table 9.6: Descriptors for Effect Significance

Absolute Concentrations in Relation to Standard	Extremely Small	Very Small	Small	Medium	Large	Very Large
Increase with development						
Above standard without scheme	Slight adverse	Slight adverse	Substantial adverse	Substantial adverse	Very substantial adverse	Very substantial adverse
Below standard without scheme, above with scheme	Slight adverse	Moderate adverse	Substantial adverse	Substantial adverse	Very substantial adverse	Very substantial adverse
Below standard with scheme, but not well below	Neutral	Slight adverse	Slight adverse	Moderate adverse	Moderate adverse	Substantial adverse
Well below standard with scheme	Neutral	Neutral	Slight adverse	Slight adverse	Slight adverse	Moderate adverse
Decrease with development						
Above standard with scheme	Slight beneficial	Slight beneficial	Substantial beneficial	Substantial beneficial	Very substantial beneficial	Very substantial beneficial
Above standard without scheme, below with scheme	Slight beneficial	Moderate beneficial	Substantial beneficial	Substantial beneficial	Very substantial beneficial	Very substantial beneficial
Below standard without scheme, but not well below	Neutral	Slight beneficial	Slight beneficial	Moderate beneficial	Moderate beneficial	Substantial beneficial
Well below standard without scheme	Neutral	Neutral	Slight beneficial	Slight beneficial	Slight beneficial	Moderate beneficial

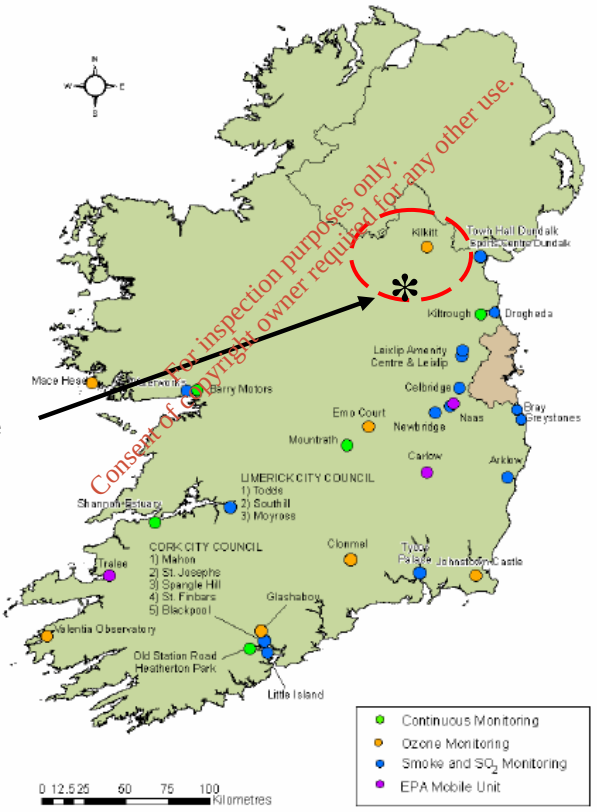
Notes: The above significance criteria have been used as a framework for this assessment. However, professional judgment is still required to determine the significance of any change.
'Standard' = air quality limit value
'Well below standard' = <75% of the air quality limit value level

9.3.3 Air Quality Baseline

Information on air quality in Ireland is available from a variety of sources including national network monitoring sites and other published sources. Given the proposed sites rural location, monitoring data has been sought from the EPA which is representative of similar areas.

Figure 9.1 *Air Quality Monitoring Network Ireland* presents the general location of the air quality monitoring stations in Ireland in relation to the proposed development site. The closest rural monitoring station to the proposed site is the Killkit air quality monitoring station, (as indicated in Figure 9.1). Killkit is located approximately 9 kilometres to the northwest of the proposed site. Monitoring data from other stations located on the east coast were not considered in this assessment because they are representative of urban areas and therefore concentrations are typically elevated due to the increase in motor vehicle emissions.

Figure 9.1: Air Quality Monitoring Network Ireland



Source: Environmental Protection Agency [6]

Table 9.7 presents the background concentrations of relevant pollutants to this assessment measured at Killkit station for the years 2002 through to 2005.

Table 9.7: Background Concentrations ((µg/m^3) - Killkit air quality monitoring station

Pollutant	Average Period	2002	2003	2004	2005
NO_2	Annual Mean	3	3	3	2
NO_X	Annual Mean	5	3	4	4
SO_2	Annual Mean	5	7	3	3

Source: Environment Protection Agency

For the purposes of air quality assessment of elevated point sources, a conservative assumption is to use the 90th percentile of the short-term observations as the background level during the assessment of short-term (e.g. maximum hourly) effects. This is approximately equivalent to twice the annual mean.

This approach has been used to account for ambient concentrations for the purposes of this assessment. Twice the average of the 2002 to 2005 average annual mean concentrations measured has been added to the short-term modelled value. For long-term averaging periods (annual), the 2002 to 2005 average annual mean concentrations measured for each pollutant has been added to the long-term modelled value. *Table 9.8* summarises the ambient concentrations assumed for this assessment.

Table 9.8: Summary of Assumed Background Concentrations (µg.m^{-3})

Pollutant	Short-term	Long-term	Data Source
Nitrogen dioxide (NO_2)	6	3	Killkit EPA air quality monitoring station
Nitrogen oxides (NO_x)	8	4	
Sulphur dioxide (SO_2)	9	4.5	

Local Atmospheric Emission Sources and Cumulative Effects

The Toomes area is mainly rural-agricultural. There are no significant atmospheric emission sources in proximity to the proposed development. The nearest industrial areas are located in Carrickmacross (extraction and processing of minerals, manufacture of ceramics and food and drink), Dundalk (chemicals, food and drink, surface coatings), and Castleblayney (chemical processing, food and drink and intensive agriculture). Industrial atmospheric emission sources in these areas are approximately 9-15 kilometres from the proposed site. The potential for cumulative effects is therefore small and these sources have been excluded from further consideration within this assessment.

9.3.4 Sources of Atmospheric Emissions

Gas turbines

The proposed development will be designed to operate on natural gas as the primary fuel with diesel oil used as back-up. The diesel oil will be limited to 0.1% sulphur in fuel as per the requirements of *EU Directive 1999/32/EC relating to a reduction in the sulphur content of certain liquid fuels.*

The new power plant will use latest technology gas turbine units to achieve an efficient and high availability plant. It is envisaged that firing on back-up fuel will occur less than 2% (7 days per year) of the firing time, predominantly to test that systems are functioning correctly.

Exhaust gases will be emitted to atmosphere through one single flue stack with a height of 60 metres. Refer to *Section 9.4.9*.

9.3.5 Key Pollutants

Overview

The above plant will release combustion gases through the burning of natural gas. Combustion of natural gas gives rise to emissions of carbon dioxide (CO_2), nitrogen oxides (NO_x) and carbon monoxide (CO). During rare periods of interrupted gas supply or during plant testing, the plant will be fired on back-up diesel oil. Similar to natural gas, combustion of diesel oil gives rise to emissions of CO_2, NO_x and CO. However, in addition, the sulphur content of diesel oil (limited to 0.1% by mass) will lead to emissions of sulphur dioxide (SO_2) in very low concentrations.

CO_2 does not affect human health except in extremely high concentrations. Emissions of CO_2 are therefore not relevant for local air quality and are not considered further through dispersion modelling.

The pollutants NO_x, CO and SO_2 are relevant to local air quality due to their potential effects on human health. However, emissions of CO from the proposed power plant (whether firing on natural gas or diesel oil) and subsequent ground level contributions are not considered significant relative to ambient concentrations and the required air quality limit value. Therefore, only emissions of NO_x are considered in detail in this assessment for periods of natural gas and diesel oil combustion. In addition, during periods of diesel oil combustion, emissions of SO_2 are considered. The following sub-sections present a brief description of the key pollutants NO_x and SO_2 referred to above and their behaviour in the atmosphere.

Oxides of nitrogen

Combustion of fossil fuels generally produces many forms of nitrogen oxides, the principal ones being nitrogen monoxide (NO) and nitrogen dioxide (NO_2), commonly referred to as NO_x. The proportion varies depending on the combustion technology and the fuel being burnt. In the case of a gas turbine unit, approximately 90 - 95% of the NO_x is present as NO, with most of the remainder being NO_2. When NO enters the atmosphere, it is gradually oxidised to NO_2 by reaction with ozone and other chemicals in the air.

NO is a colourless and tasteless gas. It is readily converted to NO_2, a more harmful form of NO_x by chemical reaction with ozone present in the atmosphere. NO_2 is a yellowish-orange to reddish-brown gas with a pungent, irritating odour and a strong oxidant.

The production of NO_x during combustion depends on several factors, with the principal ones being:

- nitrogen in the fuel;
- temperature of combustion;
- geometry of the combustion chamber; and
- ratio of fuel to combustion air.

All NO_x produced originates from nitrogen in the fuel or from nitrogen in the air that is used for combustion. NO_x from the fuel is referred to as 'fuel NO_x' and NO_x from the air is generally referred to as 'thermal NO_x'. The proportion of fuel NO_x to thermal NO_x and other emissions depends on the temperature of combustion. With an increase in combustion temperature, there is an increase in thermal NO_x emissions, and hence the overall NO_x emissions. The formation of thermal NO_x is strongly dependent on the maximum flame temperature and the period that the gases remain at this temperature.

Sulphur dioxide

Sulphur dioxide (SO_2) is a colourless, non-flammable gas with a penetrating odour that irritates the eyes and air passages. It reacts on the surface of a variety of airborne solid particles, is soluble in water and can be oxidised within airborne water droplets. The most common sources of SO_2 include fossil fuel combustion, smelting, manufacture of sulphuric acid, conversion of wood pulp to paper, incineration of waste and production of elemental sulphur. Coal burning is the single largest man-made source of sulphur dioxide accounting for about 50% of annual global emissions, with oil burning accounting for a further 25-30%. The most common natural source of sulphur dioxide is volcanoes.

9.4 Operational Phase Impacts

9.4.1 Methodology

Outline of Methodology

The approach to the assessment of emissions from the stack has involved the following key elements:

- Establishing the Ambient Concentration (AC) from consideration of local air quality monitoring data.
- Quantitative assessment of the operational effects on local air quality from stack emissions utilising "new generation" Gaussian dispersion model AERMOD.
- Assessment of Process Contributions (PC) from the proposed power plant in isolation and resultant Predicted Environmental Concentrations (PEC) taking into account cumulative effects through incorporation of the AC.

The AC has already been established in the previous sub-sections (see Section 9.3.3). The quantitative assessment includes consideration of two operational scenarios:

- Scenario 1: Operation of the proposed CCGT Plant firing on natural gas (consideration of NO_x emissions only);
- Scenario 2: Operation of proposed CCGT Plant firing on back-up diesel oil (consideration of NO_x and SO_2 emissions for short-term averaging periods only);

9.4.2 Dispersion Model Selection

A number of commercially available dispersion models are able to predict ground level concentrations arising from emissions to atmosphere from elevated point sources such as a power plant. A new generation dispersion model, the AMS/EPA Regulatory Model otherwise known as AERMOD, has been used for the purposes of this assessment. A detailed model description is included below.

The **A**merican Meteorological Society / **E**nvironmental Protection Agency **R**egulatory **M**odel **I**mprovement **C**ommittee (AERMIC), was formed to introduce state-of-the-art modelling concepts into the EPA's local-scale air quality models. AERMIC's focus was on a new platform for regulatory steady-state plume modelling; this platform would include air dispersion fundamentally based on planetary boundary layer turbulence structure, scaling and concepts. AERMOD was designed to treat both surface and elevated sources in simple and complex terrain.

Special features of AERMOD include its ability to treat the vertical heterogeneity nature of the planetary boundary layer, special treatment of surface releases, irregularly-shaped area sources, a three-plume model for the convective boundary layer, and limitation of vertical mixing in the stable boundary layer. A treatment of dispersion in the presence of intermediate and complex terrain is used that improves on that used in ISCST3 and other models.

AERMOD PRIME integrates the Plume Rise Model Enhancements (PRIME) algorithms into the AERMOD model. The PRIME model was designed to incorporate the two fundamental features associated with building downwash:

- enhance plume dispersion coefficients due to the turbulent wake
- reduced plume rise caused by a combination of the descending streamlines in the lee of the building and the increase entrainment in the wake.

AERMOD is actually a modelling system with three separate components and these are as follows:

- AERMOD (AERMIC Dispersion Model)
- AERMAP (AERMOD Terrain Pre-processor)
- AERMET (AERMOD Meteorological Pre-processor).

AERMET is the meteorological pre-processor for AERMOD. Input data can come from hourly cloud cover observations, surface meteorological observations and twice-a-day upper air soundings. Output includes surface meteorological observations and parameters and vertical profiles of several atmospheric parameters.

AERMAP is a terrain pre-processor designed to simplify and standardise the input of terrain data for AERMOD. Input data includes receptor terrain elevation data. For each receptor, the output includes a location and height scale, which is an elevation used for the computation of air-flow around hills.

9.4.3 Local Meteorology

The most important meteorological parameters governing the atmospheric dispersion of pollutants are wind direction, wind speed and atmospheric stability as described hereafter;

- Wind direction determines the sector of the compass into which the plume is dispersed.
- Wind speed affects the distances, which the plume travels over time and can affect plume dispersion by increasing the initial dilution of pollutants and inhibiting plume rise.
- Atmospheric stability is a measure of the turbulence of the air, and particularly of its vertical motion. It therefore affects the spread of the plume as it travels away from the source. New generation dispersion models, such as AERMOD, use a parameter known as the Monin-Obukhov length that, together with the wind speed, describes the stability of the atmosphere.

For meteorological data to be suitable for dispersion modelling purposes, a number of meteorological parameters need to be measured on an hourly basis. These parameters include wind speed, wind direction, cloud cover and temperature. There are only a limited number of sites where the required meteorological measurements are made.

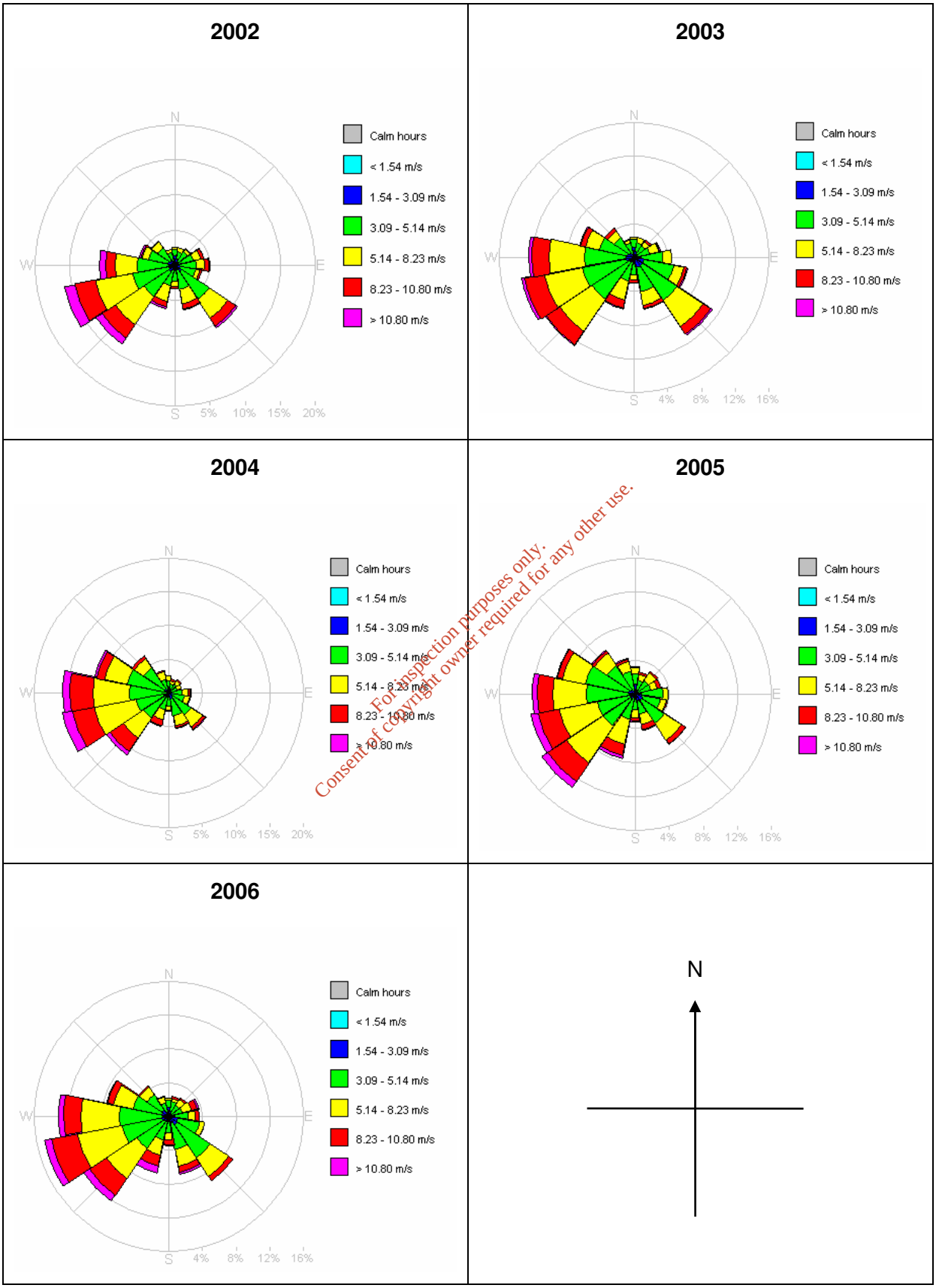
The most representative synotic station for the region of the proposed power plant that records all the required parameters is at Dublin Airport. The year of meteorological data that is used for a modelling assessment can have a significant effect on source contribution concentrations. Therefore, five years of hourly sequential data from Dublin Airport (2002 to 2006) have been used as input data for the dispersion modelling to ensure that the full range of meteorological conditions that are likely to affect plume dispersion are considered within the assessment.

Measurements made at Dublin Airport have been selected as the base meteorological data for this assessment for the following reasons:

- It is the most representative station at which all the necessary measurements are made;
- It is currently operational so the study can be verified or extended in the future, if required, using a compatible data set.

Figure 9.2 includes the wind roses for each meteorological year from 2002 to 2006.

Figure 9.2: Dublin Airport Wind Roses for 2002 to 2006



9.4.4 Terrain

The presence of elevated terrain can significantly affect (usually increase) ground level concentrations of pollutants emitted from elevated sources such as stacks, by reducing the distance between the plume centre line and ground level and increasing turbulence and hence, plume mixing.

Terrain data for the study area was included within the dispersion modelling to account for its complex nature.

9.4.5 Surface Roughness

Roughness of terrain over which a plume passes can have a significant effect on dispersion by altering the velocity profile with height, and the degree of atmospheric turbulence. This is accounted for by a parameter called the surface roughness length. The predominant land use within 10 kilometres of the proposed site can be characterised as mixed agricultural land. To account for the largely agricultural nature of the study area, a surface roughness length of 0.5 was assigned during the meteorological processing.

9.4.6 Building Downwash

The movement of air over and around buildings generates areas of flow circulation, which can lead to increased ground level concentrations in the building wakes. Where building heights are greater than about 30 - 40% of the stack height, downwash effects can be significant. The dominant buildings (i.e. with the greatest dimensions likely to promote turbulence) are the Heat Recovery Steam Generator (HRSG) and gas turbine buildings. AERMOD includes the **P**lume **Ri**se **M**odel **E**nhancements (PRIME) model algorithms to account for the effect of buildings on the dispersion of pollutants. The PRIME model has been used in this assessment to account for the structures listed in *Table 9.9*.

Table 9.9: Building / Structure Dimensions

Building	Height (m)	Length (m)	Width (m)
HRSG	36	38	31
Gas & Steam Turbine Building	28	82	48
Air Cool Condenser	30	63	52
Diesel Storage Tank Farm	15	83	31
Water Storage Tank Farm	15	73	21
Control Room, Stores, Canteen, Workshop	9	79	17

9.4.7 Percentage Oxidation of Nitrogen Monoxide to Nitrogen Dioxide

The NO_x emissions associated with gas turbine exhausts will typically comprise approximately 90-95% Nitrogen Monoxide (NO) and 5-10% Nitrogen Dioxide (NO_2) at source. The NO oxidises in the atmosphere in the presence of sunlight, ozone and volatile organic compounds to form NO_2, which is the principal concern in terms of environmental health effects.

There are various techniques available for estimating the portion of the NO_x that is converted to NO_2. Total conversion is frequently used for the estimation of the annual mean NO_2 concentrations to determine the absolute upper limit of NO_2 formation. This technique is based on the assumption that all NO emitted is converted to NO_2 before it reaches ground level receptors. Total conversion has been conservatively assumed in this assessment for consideration of long term averaging periods (annual average). Due to the limited availability of oxidants and sunlight, a 50% conversion of NO_x to NO_2 has been considered for short-term averaging periods.

9.4.8 Emission Data

The relevant emissions data for natural gas firing and for diesel oil firing corresponding to scenarios 1 and 2 respectively are summarised in *Table 9.10 Air Emissions Data*. Emissions are derived from data held by Mott MacDonald Pettit relating to similar CCGT plants in Ireland. They represent current likely 'worst case' emissions. Similarly emission characteristics such as efflux temperatures and stack diameters are derived from design knowledge and data held for similar plants. Since plant procurement has not yet occurred, precise emissions and plant details are not known. However, the selected data is representative of this type and size of plant. The emissions data would be subject to agreement with the EPA when IPPC permitting for the proposed development is progressed in the future.

Table 9.10: Air Emissions Data from CCGT Power Plant [a]

Parameter	Natural Gas (Scenario 1)	Diesel Oil (Scenario 2)
NO_X Mass Emission Rates (g/s)	86	172
SO_2 Mass Emission Rates (g/s) [b]	-	37.1
Actual Volumetric Flow (m^3/s)	962	1097
Efflux Temperature (°C)	95	135
Efflux Velocity (m/s)	26.7	29.3
Stack Diameter (m)	6.9	
Stack Height (m)	60 [c]	

Note: [a] Assumes Normal Operating Mode – CCGT at full load.

[b] Assumes 0.1% sulphur in diesel oil.

[c] See Stack Height Determination below.

The primary fuel is natural gas. Therefore, Scenario 1 assumes a 100% annual plant load factor (8,760 hrs) as a worst case assumption (in reality the annual load factor will be lower to account for periods of shut down and maintenance). In addition, relevant short-term and long-term averaging periods are considered.

As noted previously, back-up fuel will be used rarely (expected to be less than 2% of the operating hours) with normal operation being on natural gas. It is therefore not appropriate to consider long-term averaging periods (annual mean) for Scenario 2 when firing on diesel oil is considered.

In order to infer the maximum potential short-term effects for Scenario 2, the proposed CCGT power plant is assumed to operate with a 100% plant load factor when firing on diesel oil to ensure that plant operation coincides with the worst-case meteorological conditions for dispersion.

9.4.9 Stack Height Determination

In order to complete dispersion modelling it is necessary to establish an appropriate exhaust stack height. The underlying principle of air pollution control is to:

- minimise the release of pollutants to the atmosphere; and
- promote sufficient dispersion and dilution of released pollutants within the atmosphere to render them harmless at ground level.

The first part of this principle is controlling emissions at sources through abatement techniques. These are well established for gas turbines and include the use of dry low-NO_x burners when firing on natural gas and water or steam injection when firing on diesel oil. These abatement techniques are fully documented in *Chapter 3 Description of the Development*.

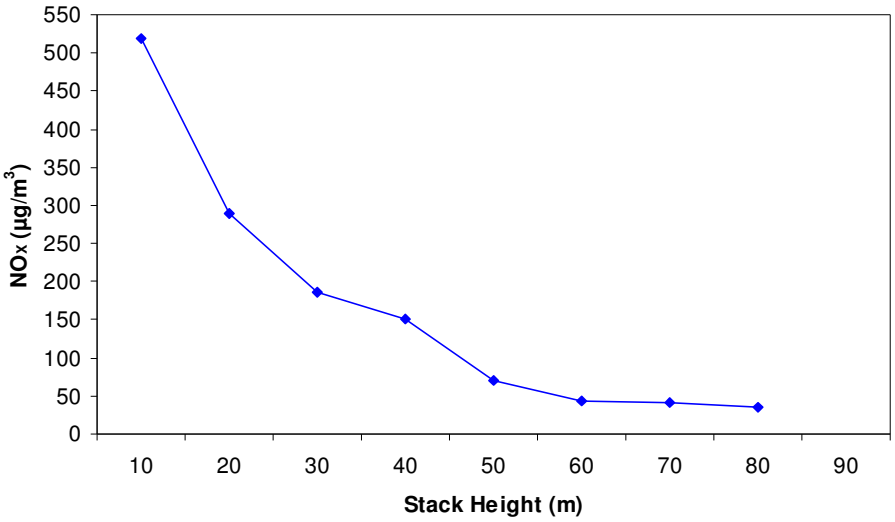
The second part is the determination of the optimum release conditions, including stack height determination to ensure that subsequent ground level concentrations of the released pollutants remain within acceptable limits. The purpose of this section is therefore to determine at what stack height local building wake effects are no longer significant.

Gas turbine exhaust gases will be released via one single individual stack. Increasing the stack height increases the potential for dispersion and dilution of exhaust gases in the atmosphere. The advanced dispersion model (AERMOD) was used to determine the maximum ground level contribution from the proposed stack as a function of increasing stack height, taking into account local buildings which tend to restrict dispersion.

The maximum predicted hourly average ground level concentrations of nitrogen oxides (NO_X) for stack heights in the range 10 metres to 90 metres are presented in *Figure 9.3* which illustrates that for stack heights below 50 metres, local building wake effects are predicted to affect dispersion substantially. For stack heights above 50 metres, ground level contributions do not reduce materially with increasing stack height.

Accounting for a margin of tolerance in the assessment methodology, a stack height of 60 metres is considered appropriate. The stack height would be subject to agreement with the EPA when IPPC permitting for the power plant is progressed in the future. In terms of gaining planning consent a stack height of 60 metres is recommended.

Figure 9.3: Stack Height Determination



9.4.10 Modelling Results

(i) Introduction

The results of modelling atmospheric emissions from the proposed development are summarised and interpreted below for each of the assessment scenarios. The model results are presented in tabular form and as contour plots.

Model runs were initially undertaken using AERMOD assuming a grid with 1 kilometre receptor spacing to a 15 kilometre radius around the facility. The results indicated that maximum impacts occurred within 5 kilometres of the development site. Modelling was therefore undertaken using AERMOD assuming a finer resolution receptor grid with 250 metre spacing within a 5 kilometres radius of the proposed development site. The results to the finer resolution grid (i.e. 250 metre grid spacing) form the basis of reporting for this assessment.

(ii) Scenario 1

The results of modelling maximum Predicted Contributions (PCs) to ground level NO_x and NO_2 concentrations from the proposed development firing on natural gas and resultant Predicted Environmental Concentrations (PECs), including the Ambient Concentration (AC), are summarised in *Table 9.11* and *9.12* and compared with the relevant air quality standards.

Table 9.11: Predicted Maximum Contributions from CCGT Power Plant (Scenario 1) (µg/m^3)

Pollutant	Averaging Period	EQS	PC Max	Max PC as % of AQLV	Magnitude of PC
NO_2	1 hour (99.79th percentile)	200	7.5	3.8	Very Small
	Annual	40	0.5	1.3	Very Small
NO_x	Annual	30	0.5	1.7	Very Small

Note: PC – Predicted Contribution
AQLV – Air Quality Limit Value

Table 9.12: Predicted Environmental Concentrations from CCGT Power Plant (Scenario 1) (µg/m^3)

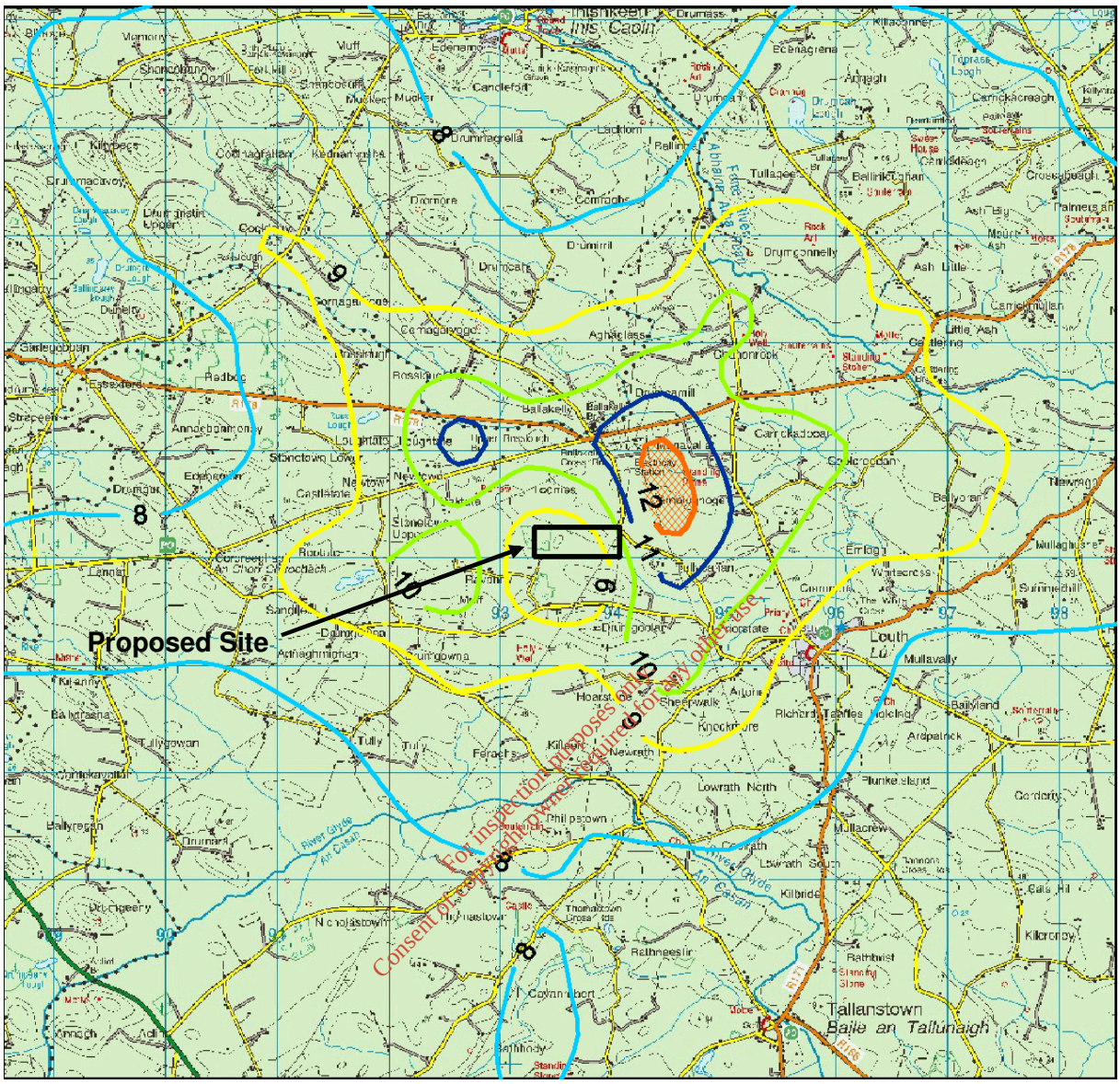
Pollutant	Averaging Period	EQS	AC	PEC Max	Max PEC as % of AQLV	Significance Descriptor
NO_2	1 hour (99.79th percentile)	200	6.0	13.5	6.8	Neutral
	Annual	40	3.0	3.5	8.8	Neutral
NO_x	Annual	30	4.0	4.5	15.0	Neutral

Note: AC – Ambient Concentration; PEC – Predicted Environmental Concentration
AQLV – Air Quality Limit Value

The results in *Table 9.11* indicate that predicted contributions of all pollutants are less than 5% of the relevant AQLVs. *Table 9.12* indicates that the resultant PECs for all pollutants, are well within the relevant AQLVs. Overall, predicted pollutant concentrations from the proposed development firing on natural gas are considered to be of neutral significance.

Contour plots of short-term and long-term NO_2 contributions are presented in *Figure 9.4* and Figure *9.5*. The contour plots indicate that the highest short-term and long-term contributions of NO_2 from the proposed development are predicted to occur in the near vicinity of the site. The closest residential receptors are minimally affected by emissions from the proposed development.

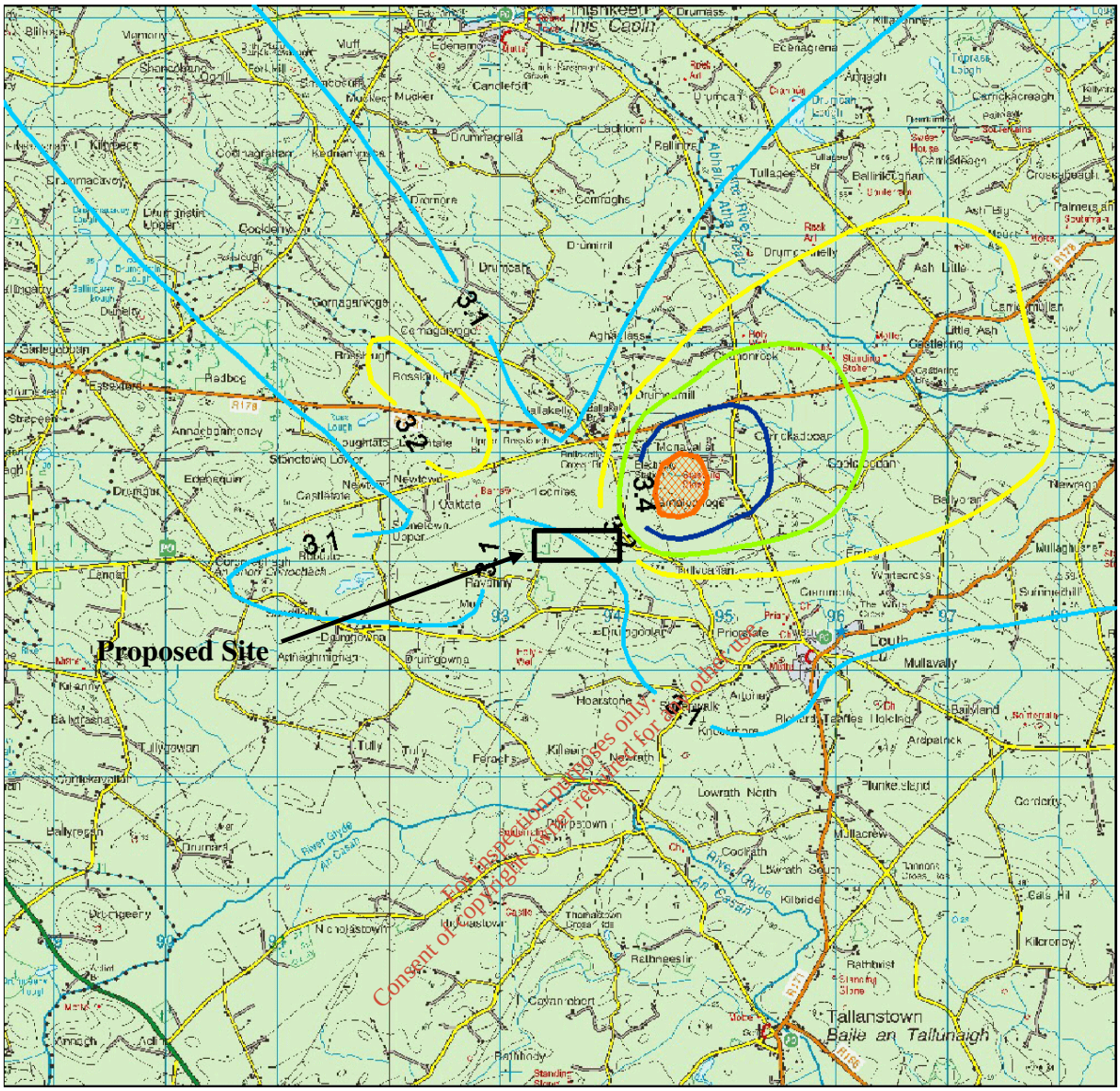
Figure 9.4: Predicted 99.79th Percentile Hourly Average NO_2 Concentrations – Scenario 1



Assumptions:

- Concentrations in µg/m^{-3}
- Proposed development firing on natural gas
- 50% of NO_x to NO_2 conversion
- 2002 meteorological year (worst case)
- Background NO_2: 6 µg/m^3
- Contours at 1 µg intervals

Figure 9.5: Predicted Annual Average NO_2 Concentrations – Scenario 1



Assumptions:

- Concentrations in $\mu g/m^{-3}$
- Proposed development firing on natural gas
- 100% of NO_x to NO_2 conversion
- 2002 meteorological year (worst case)
- Background NO_2: 3 $\mu g/m^3$
- Contours at 0.1 µg intervals

(iii) Scenario 2

The results of modelling maximum Predicted Contributions (PCs) to ground level concentrations from the proposed development when firing diesel oil and resultant Predicted Environmental Concentrations (PECs), including the Ambient Concentration (AC), are summarised in *Table 9.13* and *Table 9.14* and compared with the relevant air quality limit values (AQLVs).

In order to infer the maximum potential short-term effects, the proposed development is assumed to operate firing on diesel oil with a 100% plant load factor to ensure that plant operation coincides with the worst-case meteorological conditions for dispersion.

Table 9.13: Predicted Maximum Contributions from CCGT Power Plant (Scenario 2) (µg/m^3)

Pollutant	Averaging Period	AQS	PC Max	Max PC as % of AQLV	Magnitude of PC
SO_2	1 hour (99.73th percentile)	350	10.2	2.9	Very Small
	24 hour (99.2nd percentile)	125	3.8	3.0	Very Small
NO_2	1 hour (99.79th percentile)	200	25.3	12.7	Medium

Note: PC – Predicted Contribution
AQLV – Air Quality Limit Value

Table 9.14: Predicted Environmental Concentrations from CCGT Power Plant (Scenario 2) (µg/m^3)

Pollutant	Averaging Period	AQS	AC	PEC Max	Max PEC as % of AQLV	Significance Descriptor
SO_2	1 hour (99.73th percentile)	350	9.0	19.2	5.5	Neutral
	24 hour (99.2nd percentile)	125	9.0	12.8	10.2	Neutral
NO_2	1 hour (99.79th percentile)	200	6.0	31.3	15.7	Slight Adverse

Note: AC – Ambient Concentration; PEC – Predicted Environmental Concentration
AQLV – Air Quality Limit Value

The results presented in *Table 9.13* and *Table 9.14* indicates that the predicted contributions and resultant environmental concentrations of all pollutants considered are well within the relevant AQLVs.

Short-term contributions of SO_2 are less than 5% of the relevant AQLVs and as resultant environmental concentrations (including consideration of background concentrations) are 10% or less of the relevant AQLV, maximum short-term SO_2 impacts are considered to be of neutral significance.

Although short-term contributions of NO_2 are greater than 10% of the relevant AQLV, the resultant environmental concentrations, (including consideration of background concentrations) are less than 20% of the relevant AQLV. Maximum short-term NO_2 impacts are therefore considered to be of slight adverse significance.

To realise the effects presented in *Table 9.13* and *Table 9.14*, the proposed power plant would need to operate firing on diesel oil, coinciding with the worst-case meteorological conditions for dispersion. Even on this basis, effects are not considered to be significant and in practice, such events are unlikely and represent the absolute upper limits for short-term effects from the facility.

(iv) Air emissions during start-up and shut-down periods

During start up and shut down periods, combustion temperatures and pressures change rapidly resulting in inefficient combustion periods and therefore higher pollutant concentrations occur. NO_x concentrations during shut-down and start-up periods will be approximately two to three times higher compared to emission concentrations during normal operation. Peak emission concentrations will occur approximately 15 to 20 minutes after start-up corresponding to between 30 to 40% plant load. Once the gas turbine reaches 60% load and above, NO_x concentrations will achieve relevant emission limits.

Periods of start up and shut down are infrequent and typically occur during either scheduled or unforeseen outages. Given the limited period of the start-up and shut-down periods (typically extending no more than 30 minutes), air quality impacts resulting from elevated emission concentrations are not considered to be significant taking into account the relevant averaging periods associated with the air quality limit values.

As it is not possible to control emissions during periods of start-up and shut-down beyond operational management of combustion efficiency, compliance with emission limit values is usually exempted by the regulators. Nonetheless, the power plant will be required to maintain a record of start-up and shut-down periods by the EPA.

9.4.11 Summary

The results to this assessment indicate that the operation of the proposed plant will not lead to any breaches of relevant air quality limit values. Overall, maximum short-term and long-term impacts are considered to be of neutral significance regardless of fuel type.

9.5 Construction Phase Impacts

The major influence on air quality during the construction phase of the development is likely to be dust-generating activities such as movement of plant vehicles both on and around the site.

Nuisance caused by the deposition of construction dust is likely to be the main issue in relation to local air quality effects. No dust nuisance criteria have been formally adopted in Ireland.

Activities that may cause fugitive dust emissions are as follows:

- Earthworks and civil preparations;
- Handling and disposal of spoil;
- Wind-blow from stockpiles of particulate material;
- Movement of vehicles, both on and off site; and
- Handling of loose construction materials.

There are no sensitive receptors within 100m of the site boundary, a distance commonly adopted as being the extent to which dust effects will be experienced.

The level and distribution of construction dust emissions will vary according to factors such as the type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of suppression measures.

The main effect of any dust emissions, if not mitigated, would be nuisance due to soiling of surfaces, particularly windows, cars and laundry. The effect of the construction phase, if un-mitigated would be minor to moderate adverse in magnitude, short-term and local in scale. Implementation of the mitigation measures outlined in *Section 9.6* will ensure that emissions of nuisance dusts will be minimised.

Engine exhaust fumes will be controlled through proper and regular maintenance and, where practicable, construction plant will be located away from workers' mess buildings and offices.

Construction of the proposed power plant will have associated construction traffic, comprising contractors' vehicles and Heavy Goods Vehicles (HGV's), diggers, and other diesel-powered vehicles. This will result in emissions of nitrogen oxides, fine particles and other combustion related pollutants. Emissions of combustion related pollutants from the construction phase are expected to be negligible in terms of the effect on local air quality due to the low vehicle numbers and are therefore not considered further within this assessment.

9.6 Mitigation Measures

9.6.1 Construction Phase

In order to control potential impacts from dust raising activities on site during construction a Construction Environmental Management Plan (CEMP) will be prepared and implemented by the nominated contractor during the construction phase of the project. The CEMP will include a dust minimisation Plan. Construction activities are likely to generate some dust emissions, particularly during site clearance and bulk excavation.

The following avoidance, remedial or reductive measures will be implemented as part of the dust minimisation plan where appropriate:

- Limiting vehicle speeds on the construction site.
- During dry periods, spraying surfaces with water will control dust emissions from heavily trafficked locations.
- Limiting the speed of vehicles within the site and the use of a mechanical road sweeper could prevent re-suspension of material spilled from trucks entering or leaving the site.
- All vehicles exiting the site will make use of wheel wash facilities prior to exiting to public roads, to ensure mud and other wastes are not tracked onto public roads. Public roads outside the site will be regularly inspected for cleanliness, and cleaned as necessary.
- Topsoil and other dusty material being removed from site will be transported in covered trucks, where the likelihood of emitting dust is high, and during dry weather conditions the area of removal will be sprayed with a mobile tanker on a regular basis to control dust emissions.

- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by insuring that emissions from vehicles are minimised through regular servicing of machinery.
- Where drilling or pavement cutting, grinding or similar types of finishing operations are taking place, which may be a significant local source of fine particulate emissions and especially particles less than 10 µm in aerodynamic diameter (PM_{10}), measures to control emissions will be used to prevent a nuisance within the locality.
- If cement is stored in a silo on site, a filter will be fitted to the silo to minimise dispersion of cement dust. Alternatively, ready-mix concrete will be supplied by truck.

9.6.2 Operational Phase

The plant will be built to the highest modern standards and utilising the most up to date technology. This should ensure that impacts of the development are minimal, as demonstrated in this assessment. The following measures will assist in minimising the air quality impacts of the development.

- an exhaust stack height of at least 60 metres has been proposed to ensure effective dispersion of emissions;
- whilst the final design/model of gas turbine to be installed has not been decided, state of the art low NO_x technology will be employed which will include dry-low NO_x burners for use when gas firing and water injection during diesel firing; and
- firing on diesel will be rare and a low sulphur fuel containing 0.1% sulphur, or lower will be used.

9.7 Summary Conclusion

Due to the scale of the proposed development, no impacts on climate have been identified during either the construction or operational phases.

During the construction phase there is a potential for dust to be generated. As there are no dwellings within the range of dust deposition it is anticipated that dust will not impact on nearby residences. However, dust suppression techniques will be implemented to ensure that dust generation is minimised. These measures include water spraying, wheel washing and sheeting of vehicles.

Air impact assessments during the operational phase were assessed based on a “worst-case” scenario approach in relation to weather conditions, continuous operation, natural gas and diesel firing. 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 on natural gas or diesel.

Concerns were raised during the public consultation, (described in *Section 1.4.5*) regarding the potential health impacts associated with the development. The most significant risk relates to emissions to the atmosphere. As demonstrated by the air quality assessment, emissions from the plant are predicted to be within air quality limit values. There are therefore no predicted health impacts associated with the development.

10 Ecology

10.1 Introduction

Environmental Resources Management (ERM) Ireland Ltd. has been commissioned by Mott MacDonald Petit (MMP) to undertake an Ecological Impact Assessment (EcIA) for the development of a proposed power station on a site in the townland of Tomes, Co Louth.

The purpose of this assessment is:

- to identify the baseline ecological resource of the proposed site;
- identify the potential impact of the proposed development;
- recommend measures to mitigate probable impacts; and
- identify any residual impacts to the site ecology.

In order to assess potential impacts upon ecological resources, the assessment has focused upon the following aspects:

- flora growing in the area to be affected by the development;
- fauna (insects, mammals, birds, herpetofauna and fish); and
- ecosystem functionality.

The geographical scope of the assessment comprised the area occupied by the proposed route and a fifty metres buffer zone around the site.

10.2 Methodology

10.2.1 Introduction

The scope and methodology used for this assessment are based upon the Institute of Ecology and Environmental Management's (IEEM) *Guidelines for Ecological Impact Assessment* and satisfies the requirements of the Environmental Protection Agency's (EPA) *Guidelines on the Information to be Contained in Environmental Impact Statements*.

The basis for the assessment was an initial Phase 1 habitat survey of the entire site to gain broad-scale baseline information about the site's habitats, supplemented by a detailed desktop review of all relevant literature and comments concerning the ecological resource of the site by relevant organisations and specialists. Targeted specialist surveys for flora, mammals, birds and invertebrates were also undertaken to further quantify the site's ecological resource. These surveys were undertaken in late May, 2007.

10.2.2 Desk-top Review and Consultations

ERM undertook an extensive desktop review in order to establish baseline conditions for the proposed site. The principal sources of information that were referred to included:

- a review of existing published ecological information and, where possible, any unpublished accessible sources;
- a review of the National Parks and Wildlife Service (NPWS) database;
- identification of any protected species, habitats or Red Data Book species; and
- A review of high resolution aerial photography was carried out to identify and create initial outline maps of conspicuous habitat which were subsequently verified and 'ground truthed' by the Phase 1 field surveys.

All consultations with the above agencies, with regard to the scope of the assessment and relevant mitigation measures were undertaken by Quinn Group and MMP.

10.2.3 Scope of the Ecological Assessment

In response to scoping consultations between the lead designer and the NPWS, the NPWS advised that a survey of habitats, flora and fauna should be undertaken with the potential impacts of the proposed development to the above assessed, with particular emphasis placed on the potential impacts to protected species.

10.2.4 Field Surveys

Field surveys, carried out to inform the ecological baseline assessment, are set out below. These surveys were undertaken in order to verify the information gathered during the desktop exercise and to identify, map and evaluate the habitats located within and adjacent to the proposed site.

10.2.5 Habitats and Flora

Phase 1 Habitat Survey

A Phase I Habitat Survey was undertaken of the site and a surrounding buffer zone up to 500m from the site boundary. The Phase I Habitat Survey was undertaken in line with the *Heritage Councils Draft Habitat Survey Guidelines, 2002*. The Phase I survey examined the ecological baseline of the site with emphasis placed upon identifying the habitats occurring on site according to the Heritage Councils *A Guide to Habitats in Ireland*, 2000. The Phase I Habitat Survey was undertaken on the 1st and 2nd of May 2007, by ERM's ecologist Karin Schroder.

Conditions during the Phase I survey allowed ERM's ecologist to successfully identify and map the habitats occurring within the study area. 1:5,000 scale field maps were used during the survey. GPS records were taken during the survey to allow for the accurate GIS mapping of habitats. Habitat maps were produced using GIS Arc View 9.2. *Appendix 10.1* illustrates the location of all designated sites within a 10 kilometre radius of the proposed site.The Habitat Map with the site footprint outlined, along with an ecological sensitivity map, are provided in *Appendix 10.2* and *10.3* of this EIS.

Flora Survey

Following the results of the Phase I Habitats Survey, a detailed Phase II Flora survey was undertaken to identify a complete flora species inventory for the site. The flora survey included a detailed walkover survey of the site, in line with a Joint Nature Conservation Committee (JNCC) National Vegetation Classification (NVC) walk over survey. As the NVC is not applicable to the context of the site, the vegetation identified was used to further refine the extent of habitats and micro-habitats according to the Guide to Habitats in Ireland. Therefore the results of the floral survey, which are outlined in Section 10.4.1 of this report, are described with reference to the appropriate Level 3 Habitat of the Guide to Habitats in Ireland. In addition to the walkover survey a total of fifteen Target Areas were surveyed on site. Each target area is denoted as **T1, T2** etc. and the location of each target is illustrated on the Habitat Map, shown in *Appendix 10.2* of this assessment. The recording of sample locations and vegetation lists were also guided by the NVC Users Handbook. However, due to the Irish context of the site all plant identification follows *Webb et al. (1996)* for higher plants and *Smith (1991)* for mosses. References to target locations are made in the text below.

The Phase II flora survey was undertaken on the 24th, 25th, and 27th May 2007. The conditions during the survey were favourable with low rainfall. Seasonal limitations were experienced with respect to identifying grass and herbaceous plant species that flower later in the summer season.

10.2.6 Fauna

Mammals

The potential for habitats to support protected mammal species were identified during the Phase I Habitat Assessment. Habitats with the potential to support protected species were subsequently surveyed for the presence of mammal species. Records of mammal species that are considered to be common, such as fox, rabbit and brown rat were not noted, except when it was considered that the paths or burrows may also be used by a mammal of conservation importance (i.e. badgers).

The likelihood for the habitats recorded on site to support protected mammal species dictated the range of species-specific surveys undertaken during the field assessment. As no suitable habitat for otters was recorded on site, no specific surveys for otters were undertaken.

The protected mammal species deemed likely to occur within or adjacent to the site include badgers, Irish hare and bats. The potential for the site to support roosting and foraging bat species was assessed.

The survey for badgers involved searching for field signs of badgers. These field signs, as described in *Neal & Cheeseman (1996)* and *Bang & Dahlstrom (2001),* include:

- Setts (below ground resting places);
- Pathways;
- Prints;
- Faecal deposits;
- Latrines (and dung pits used as territorial markers);
- Feeding signs (snuffle holes);
- Hair; and

- Scratch Marks.

Any of the above signs are indicative of the presence of badgers. While badgers are considered to be a woodland animal, they have adapted well to the relative lack of woodlands in Ireland, with over half of the badger setts recorded in the country associated with hedgerows *(Hayden & Harrington, 2002).* As badgers construct setts on free draining soils which accommodate the setts' intricate tunnel and chamber system, the survey also concentrated on areas of undulating topography with free draining slopes.

The presence of pine martens on site can also be identified by many of the above field signs i.e. pine marten spraints, prints, lairs, feeding signs such as bird carcasses etc.

The presence of Irish hares within and adjacent to the site was recorded during the Phase I Habitat Survey and the NVC Walk-over Survey.

Mature trees occurring within the site were also assessed for their potential to support roosting bats. Trees capable of supporting roosting bats display the following features:

- Hollow cavities which provide stable environments;
- Crevices;
- Limb fractures;
- Loose bark; and
- Ivy.

The examination of trees for their potential to support roosting bats was undertaken following the guidance outlined in the National Roads Authorities *Best Practice for the Conservation of Bats in the Planning of National Road Schemes.* However, no surveys for bat activity using bat detectors were undertaken during the field surveys. Nevertheless, as outlined in the results of the mammals survey in *Section 10.4.2* it is assumed that a number of bat species forage within the site.

Birds

Notes were made of all birds observed during the course of the habitat surveys. A specific bird survey was also undertaken. This involved a fixed line transect through the site. Three transects running in an west to east direction were established and all birds seen and heard up to 50m either side of each transect were recorded. Each transect was surveyed three times, once daily on the 24th, 25th and 28th May, 2007. Notes were also taken of birds flying overhead.

The results of this survey provided the team with a comprehensive overview of the birds present within and adjacent to the site.

Invertebrates

Pit-fall traps were randomly placed throughout the site. The survey of invertebrates aimed to provide qualitative information on the range of terrestrial invertebrates present on site. Six pit-fall traps were placed throughout the site. These traps were placed in habitats considered to be of higher ecological importance. The invertebrate survey was not designed to provide a comprehensive baseline for the range of invertebrate species recorded on site.

Herpetofauna

The presence of herpetofauna (amphibians and reptiles) within the site was recorded during the Phase I Habitat Survey and the NVC walk over survey. These field surveys were supplemented by the results of the Habitat Survey and a consideration of the potential of the habitats recorded on site to support amphibians. As outlined in the *Herpetofauna Workers Manual* habitats considered likely to support amphibian species include wetland habitats with high water tables or open water bodies such as the wet grassland and wet woodland and associated micro-habitats identified within the site.

Records of amphibian activity on site are outlined in *Section 10.4.4.*

10.2.7 Ecological Evaluation

The evaluation of the ecological resource was assessed according the NRA's Site Evaluation Scheme outlined in *Table 10.1* below. These criteria evaluate the significance of an ecological resource within a defined geographical context. The IEEM's Guidelines for Ecological Impact Assessment, which also evaluate ecological resources according to a defined geographical context provided guidance for the baseline ecological evaluation. The Ratcliffe Criteria (*Ratcliffe, 1976*), in particular the "size", "rarity", "diversity" and "naturalness" criteria were also referred to during the baseline categorisation.

Table 10.1: Site Evaluation Scheme

Rating	Qualifying Criteria
5	**Internationally Important** Site designated (or qualifying for designation) as SAC* or SPA* under the EU Habitats or Birds Directives. Undesignated sites containing good examples of Annex I priority habitats under the EU Habitats Directive. Major salmon river fisheries. Major salmonid (salmon, trout or char) lake fisheries.
4	**Nationally Important** Sites or waters designated or proposed as an NHA* or statutory Nature Reserves. Undesignated sites containing good examples of Annex I habitats (under EU Habitats Directive). Undesignated sites containing significant numbers of resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive or species protected under the Wildlife (Amendment) Act 2000. Major trout river fisheries. Water bodies with major amenity fishery value. Commercially important coarse fisheries.
3	**High Value, locally important** Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or significant populations of locally rare species. Small water bodies with known salmonid populations or with good potential salmonid habitat. Sites containing any resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive. Large water bodies with some coarse fisheries value.
2	**Moderate Value, locally important**

Rating	Qualifying Criteria
	Sites containing some semi-natural habitat or locally important for wildlife. Small water bodies with some coarse fisheries value or some potential salmonid habitat. Any water body with unpolluted water (Q-value rating 4-5).
1	**Low Value, locally important** Artificial or highly modified habitats with low species diversity and low wildlife value. Water bodies with no current fisheries value and no significant potential fisheries value

10.3 Receiving Environment

10.3.1 Surrounding Landscape

The site is located within a low lying area of peaty soil at an altitude of approximately 35 to 42 m above sea level. The site consisted of a complex mosaic of three woodland types, scrub and two grassland types on generally poorly drained peaty soils. Small limestone outcrops occur in places. The site is broadly partitioned on an east – west axis with habitats of high ecological value occurring to the west of the site and habitats of lower value occurring to the east.

The site is surrounded by improved and semi-improved grassland, managed under an existing agricultural grazing regime. An area of alder carr wet woodland borders the eastern boundary of the site, while another wet woodland habitat is located approximately 1 kilometre to the south of the site.

10.3.2 Designated Sites Within or Adjacent to the Site

The site synopsis for Conservation Sites within a 10 kilometres radius including digital data was obtained from the National Parks and Wildlife Service (NPWS) of the Department of Environment, Heritage and Local Government.

The Dundalk Bay cSAC is located approximately 12 kilometres to the east of the site. The cSAC is directly linked to the site by the River Glyde, to which the proposed power plant will discharge its waste water. One Special Protection Area (SPA) and 14 pNHA have been identified within a 10 kilometre radius of the site. The location of designated sites in relation to the proposed development is illustrated in *Appendix 10.1*. The following sites occur with the 10 kilometre radius:

- Stabannan-Braganstown SPA (site code 000456)
- NHA Lough Fea Demesne (site code 000560)
- NHA Lough Naglack (site code 000561)
- NHA Monalty Lough (site code 001608)
- NHA Spring and Corcrin Loughs (site code 001671)
- NHA Nafarty Fen (site code 002077)
- pNHA Stabannan-Braganstown (site code 000456)
- pNHA Corstown Loughs (site code 000552)
- pNHA Ardee Cutaway Bog (site code 001454)
- pNHA Darver Castle Woods (site code 001461)

- pNHA Ballyhoe Lough (site code 001594)
- pNHA Lough Hall and Ardee Woods (site code 001616)
- pNHA Stephenstown Pond (site code 001803)
- pNHA Reaghstown Marsh (site code 001828)

Stabannan-Braganstown SPA (site code 000456)

Stabannan-Braganstown SPA is situated to the south east of the site. It is bounded to the north and south by low, rolling hills. Much of the site was formerly marshland or wet grassland, but is now drained and agriculturally improved. Stabbanan-Braganstown is designated due to its importance as a feeding area for wintering waterfowl and supports an internationally important population of Greylag Goose, with over 35% of the national total. It also has a regular population of Greenland White-fronted Goose though numbers are relatively low. A regionally important population of Whooper Swans is also present on site. Bewick's Swans, formerly recorded with much larger numbers now occur in low numbers on site, reflecting a decline throughout Ireland. Other species typically associated with coastal habitats and wet grassland habitats comprise Lapwing and Golden Plover. The site is of most importance as the largest Greylag Goose site in Ireland and also supports three species listed on Annex I of the Birds Directive comprising Greenland White-fronted Goose, Golden Plover and Bewick's Swan. The area is also a proposed Natural Heritage Area.

Corstown Loughs (site code 000552)

Corstown Loughs is situated 4 kilometre to the west of Ardee and comprises a variety of habitats such as small sized freshwater lakes, wet woodland and marginal wet grassland. Several plant species of note occur here comprising Lesser Reedmace (*Typha angustifolia*), Tufted sedge (*Carex elata*) and Marsh Fern (*Thelypteris palustris*). Besides areas of extensive reedbeds the site also supports areas of carr comprised of alder (*Alnus glutinosa*), Birch (*Betula pubescens*) and willow (Salix sp.). A number of rare plant species of regional interest have been recorded here and Corstown Lough Greater is one of the largest lakes in the area providing refuge for local wildfowl species.

Lough Fea Demesne (site code 000560)

Lough Fea Demesne is located to the west of the survey area. It comprises two areas of limestone grassland which are extremely rich in varieties and numbers of orchids such as Fragrant orchid (*Gymnadenia conopea*) and Common spotted orchid (*Dactylis fuchsii*). Calcareous grassland areas are dominated by Quaking grass (*Briza media)*, Heath grass (*Danthonia decumbens*) and Glaucous sedge (*Carex flacca*). Several rock outcrops are also present on site supporting uncommon species and scare species such as Upright brome (*Bromus erectus*). A small marsh established within a hollow consists of three areas which are distinguished by the water level supporting a variety of wetland plants. Areas of mature woodland also occur on site dominated by mature beech (*Fagus sylvatica*), ash (*Fraxinus excelsior*) and Scots pine (*Pinus sylvestris*). The ground flora within the woodland area is a complete sword of Dog's mercury (*Mercurialis perennis*) which is scarce in Ireland and also supports uncommon breeding birds such as Blackcap and Jay, as well as accommodating most of the common species. A cave is present in the north of the site. The site is considered of regional importance due to the limited extend of limestone grassland within Monaghan county. The area is of outstanding botanical interest even though it is small in extent, with a rich abundance of species. The presence of two scarce species adds to the site's interest.

Lough Naglack (site code 000561)

Lough Naglack is situated to the west of the proposed development. This calcareous lough supports a very rich flora together with adjoining grassland, calcarous march and mixed woodland. The most interesting part of the area is established at the northern end where a marsh and a small limestone slope are enclosed by two areas of woodland. Although the limestone grassland is small it supports a species rich plant community, being a fairly open sward with Quaking grass (*Briza media*) the dominant grass. Pale flax (*Linum bienne*) occurs here at its northern-most Irish limit. Most of the lough is fringed by reedbeds and trees providing suitable breeding habitats for a pair of Grey herons. Reedbeds contain several *Chara* species. In addition, Horned pondweed (*Zannichellia palustris*), a scarce species in Ireland has also been recorded from the northern part of the lake. Current threats to the site are caused by angling activity and eutrophication. The importance of this site lies in its diversity of calcareous habitats supporting a rich flora. The presence of several stoneworts and a rare species of pondweed in the lake as well as the presence of Pale flax in the grassland adds significantly to the interest of the site.

Ardee Cutaway Bog (site code 001454)

The site is a raised cutaway bog located to the south of the proposed power plant with such species such as Heather (*Calluna vulgaris*), Round-leaved Sundew (*Drosera rotundifolia*), Tormentil (*Potentilla erecta*), Bottle Sedge (*Carex rostrata*), Purple Moorgras (*Molinia caerulea*) and Royal Fern (*Osmunda regalis*) while channels and wet pools also support Bogbean (*Menyanthes trifoliata*). A notable feature of the site is the presence of areas where Bog Mosses (*Sphagnum sp.*) occur abundantly. An area of birch (*Betula sp.*) occurs on the eastern side of the site. The site of Ardee Cutaway Bog is of ecological value as a regenerating raised bog, a habitat that is rare in the region.

Darver Castle Woods (site code 001461)

Darver Castle Woods is located south of Readypenny Cross in the grounds of Darver Castle to the east of the survey area. It is a mixed deciduous woodland of beech (*Fagus sylvatica*), alder (*Alnus glutinosa*), hawthorn (*Crataegus monogyna*) and ash (*Fraxinus excelsior*). It has a diverse understorey which consists of orchids, plants of marshy grounds and woodland species such as Spotted Orchid (*Dactylorhiza fuchsii*), Yellow Flag (*Iris pseudacorus*), Horsetail (*Equisetum palustre*), Lesser Celandine (*Ranunculus ficaria*) and Dog Violet (*Viola reichenbachiana*). Wet deciduous woodland is an uncommon habitat in the region and this is a site worthy of conservation and regeneration into Ash woodland.

Ballyhoe Lough (site code 001594)

Ballyhoe Lough, located on the Monaghan/Meath border, is a fairly acid, peaty lough which is divided into two by a strip of land covered by willow (Salix sp.), Common Reed (*Phragmites communis*) and Alder (*Alnus glutinosa*). Around the edge is a fringe of Common Reed (*Phragmites communis*), Club-rush (*Scirpus lacustris*) and White Water-lily (*Nymphea alba*). The site includes a peninsula which contains wet grassland habitats and islands, covered with trees and shrubs, which are believed to be crannogs. The lough is of local importance mainly because it is acid and peaty, in contrast to most loughs in County Meath. In addition, the bird populations present are of great interest and this combination of interests make the lake one of the more unusual lakes in the county. Bones of the Irish Giant Deer, mainly skulls and antlers, have been found in and around the lake.

Monalty Lough (site code 001608)

Monalty Lough lies 2.5 kilometre to the west of Carrickmackross and to the west of the proposed power plant at Toomes. A lot of the lake is fringed by a belt of reeds (*Phragmites australis*) which is backed by a narrow strip of woodland or scrub, often dominated by willow species (Salix spp.). Wet grassland habitats occur in low laying areas adjacent to the lakeshore dominated by Creeping Bent (*Agrostis stolonifera*) with rushes and wetland herb species. Five stonewort species and a wide variety of bird species have also been recorded here. The site has been selected as a Natural Heritage Area due to its richness of birdlife.

Lough Hall and Ardee Woods (site code 001616)

Lough Hall and Ardee Woods is located to the south of the survey area and contains good examples of both dry and wet woodland habitats with a representative ground flora. The areas of Red House, 1 kilometre north of Ardee, and Lodge Wood, consist of deciduous woodland habitats containing a mixture of Beech (*Fagus sulvatica*), Oak (*Quercus robur*) and Ash (*Fraxinus excelsior*) with some Yew (*Taxus baccata*), Elm (*Ulmus glabra*), Holm Oak (*Quercus ilex*) and Horse Chesnut (*Aesculus hippocastanum*). An area of wet woodland occurs to the north of the ruins of Louth Hall. It contains a good diversity of species such as Willow (Salix sp.), Alder (*Alnus glutinosa*) and Downy Birch (*Betula pubescens*). Yellow Flag (*Iris pseudacorus*) and Meadowsweet (*Filipendula ulmaria*) are common in the understorey. The margins of the lake are colonised by Bulrush (*Typha latifolia*). There are also several undisturbed islands within the lake with good species diversity. The site supports some of the last remaining woodland habitats within the area and is also of value for educational purposes as well as providing habitats for local woodland flora and fauna.

Spring and Corcrin Loughs (site code 001671)

The site is situated 2 kilometres east of Carrickmackross and consists of two calcareous lakes which are similar in plant species inventory. The lake margins are dominated by White Water-lily (*Nymphea alba*) and Common Reed (*Phragmites australis*) while one species of Stonewort has also been recorded within an area of calcareous mud around the lake edge. Further habitats and plant communities comprise acidic grassland, wet grassland, freshwater marsh and scrub. Its value lies in the botanical interest and the presence of one species of Stonewort. Spring and Corcrin Loughs are situated 7.5 kilometres to the west of the proposed power plant.

Stephenstown Pond (site code 001803)

Stephenstown Demesne, located to the east of the survey area, boasts of two Natural Heritage Areas, one of which is Stephenstown Pond. It is a large, artificially excavated pond with fringing emergent vegetation of Common Reed (*Phragmites australis*) and Reed Canary Grass (*Phalaris arundinacea*). Prominent stands of Water Lilies, *Nuphar lutea* and *Nymphea alba*, are established on the northern and southern shoreline. The site has been designated because it is representative of open water bodies in the area and supports thriving, typical pond wildlife and extensive stands of aquatic vegetation may account for the rich invertebrate life.

Reaghstown Marsh (site code 001828)

Reaghstown Marsh consists of two small areas of marsh to the south of the proposed development and also contains a small lake with associated wetland habitats and larger areas of willow scrub with a wet sedge-rich field layer. Wetter areas are dominated by Eared Willow (*Salix aurita*) with a scattering of hawthorn (*Crataegus monogyna*) and Ash (*Fraxinus excelsior*). The drier areas are dominated by grasses such as Reed Canary-grass (*Phalaris arundinacea*), Cock's Foot (*Dactylis glomerata*), Yorkshire Fog (*Holcus lanatus*), Meadow Sweet (*Filipendula ulmaria*) and Yellow Flag (*Iris pseudacorus*). Water Horsetail (*Equisetum fluviatile*), Bottle Sedge (*Carex rostrata*) Marsh cinquefoil (*Potentilla palustris*) occur within wetter areas of the site which is of interest as an example of a freshwater marsh in an area where many of these sites have been destroyed by drainage.

Nafarty Fen (site code 002077)

This wetland lies in a hollow north of Carrickmackross to the west of the survey site. It contains a mixture of sedges, rushes and reeds with a fringe of willows and some planted trees. A reedbed of Common Reed (*Phragmites australis*) covers much of the centre of the site. Outside the reeds there is a community of sedges such as *Carex acutiformis* and *C. disticha*. The largest area overall is covered by a mixture of Meadowsweet (*Filipendula ulmaria*), Sharp-flowered Rush (*Juncus acutiflorus*), Yellow flag (*Iris pseudacorus*) and Great Willow-herb (*Epilobium hirsutum*) with occasional Wild Angelica (*Angelica sylvestris*), Lady's Smock (*Cardamine pratensis*) and Red Fescue (*Festuca rubra*). Some of the vegetation floats as a craw on the water. Willows are most numerous along the northern edge where both Grey Willow (*Salix cinerea*) and Earted Willow (*Salix aurita*) occur, together with little Silver Birch (*Betula pendula*) and Scot's pine (*Pinus sylvestris*). The site is used by moderate number of Snipes in winter as well as by Water Rail, both probably along with Sedge Warbler, Reed Bunting and Mallard.

10.4 Field Survey Results

10.4.1 Habitats

The terrestrial habitats recorded within the survey area are presented in the Habitat Map, *Appendix 10.2*. Habitats are described according to the Heritage Council's Guide to Habitats in Ireland. This is a hierarchical habitat classification scheme, with broad habitats described at Level 1 and individual habitats described at Level 3. Two broad (Level 1) habitat groups were identified within the survey area:

1. Grassland; and
2. Woodland & Scrub.

Each of the broad habitats and the individual habitats (Level 3 habitats) making up these broad groups are described below. Other Level 3 habitats, representing Level 1 Habitat classifications such as peatland and freshwater habitats were also identified on site. These habitats are not dominant within the site and occur as part of a mosaic of habitats dominated by woodland or grassland habitats. Where such Level 3 habitats occur, they are described under the heading of the dominant habitat in the text that follows below.

Woodland Habitats

The woodlands identified within the site have been classified as:

- WN6 - Wet Woodland
- WD2 – Mixed Broadleaved/Conifer Woodland
- WS1 – Scrub

Wet Woodland (alder/willow carr) (WN6) (*Figure 10.1*) and associated fen **(PF1)** and marsh communities **(GM1)** occurred within calcareous spring-fed hollows in low areas to the western and eastern extremes of the site. The woodlands are partially bound by old stone walls and fences offering at least some protection from ingress by cattle. An internal wood bank (ca. 0.75m wide) was also observed. The woodland canopy consisted of extensive mono-dominant stands of 12m-tall *Alnus glutinosa* with *Salix cinerea* ssp. *Oleifolia* forming a sub layer. On the more peaty soils, extensive stands of *Salix aurita* occurred. Dead alder boles supported the bracket fungus *Daedalyopsis confragosa*. Ash regeneration was locally frequent. *Crataegus monogyna* and *Ligustrum vulgare* regeneration in the form of seedlings also occurred in places.

Figure 10.1 Illustration of Wet Woodland Alder Carr

In old ponded vegetated drains or peaty hollow **[T1-T2 (Grid references H 93338 02214 and H 93376 02185 respectively on habitat map],** a diverse herb flora occurred including several species characteristic of fens. The herb flora comprised extensive stands of *Filipendula ulmaria, Equisetum fluviatile* and *Carex rostrata, Apium nodiflorum, Angelica sylvestris, Carex paniculata* **(Figure 10.2),** *Galium palustre, Potentilla palustris, Juncus effusus, Cardamine pratensis, Glyceria notata, Poa trivialis, Ranunculus flammula, Potamogeton natans, Veronica beccabunga, Hydrocotyle vulgaris, Carex nigra, Eriophorum angustifolium, Berula erecta*, *Carex demissa, Equisetum palustre, Mentha aquatica, Sparganium erectum, Glyceria notata,* and *Typha latifolia*. An occasional patch of *Eriophorum angustifolium* also occurred in a small hollow.

At the micro-topographical scale, drier hummocks were colonised with 'heathy' grassland species notably *Potentilla erecta* and *Anthoxanthum odoratum*. The fern *Dryopteris dilatata* occurred on the drier tree bases. Mosses were locally frequent including *Pseudoscleropodium purum, Thuidium tamariscinum, Brachythecium rutabulum, Calliergonella cuspidata* and *Mnium hornum*. The moss *Hypnum cupressiforme* agg., and the fern *Polypodium* sp. occurred on leaning alder boles.

Betula pubescens was locally dominant together with the occasional *Fagus sylvatica* sapling. Dense *Rubus fruticosus* agg. was the dominant subshrub under the birch canopy. The herb layer was very species-poor comprising *Geranium robertianum, Holcus lanatus, Epilobium montanum, Geum urbanum,* and stands of *Urtica dioica*, the latter denoting localised nutrient enrichment. Mosses comprised *Brachythecium rutabulum, Mnium hornum* and *Thuidium tamariscinum*. Small wet peaty hollows occurred within the birch stands colonised with *Juncus effusus* and *Mentha aquatica*. *Hedera helix* forms a dense carpet in places.

The areas of wet woodland described above grades into **Mixed Broadleaved/Conifer Woodland (WD2) [(T3-T4) (Grid references H 93290 02185 and H 93218 02310 respectively)]** of largely non-native woody species in drier areas towards the west of the site. Canopy trees comprised *Pinus sylvestris, Acer pseudoplatanus*, *Larix* sp., *Picea* sp., and *Fagus sylvatica*. *Fraxinus excelsior* regeneration in the form of seedlings was regenerating well in places. The understorey was reasonably well-developed in places largely consisting of the occasional mature and sapling stage *Crataegus monogyna* (ca. 2m tall) and *Sambucus nigra* with occasional *Rosa canina*, poorly developed *Ulex europaeus* and stand of *Corylus avellana*. Dense stands of *Rubus idaeus, Pteridium aquilinum* and *Rubus fruticosus* agg. were locally abundant and notable in open glades, **[(T5-T6) (Grid references H 93334 02098 and H 93351 02123** (*Figure 10.2*)**]** and occurred often in mosaics with *Ulex europaeus*-dominated scrub and species-poor grassland consisting of such grasses as *Arrhenatherum elatius* var. *bulbosum*, and *Holcus lanatus*.

Figure 10.2 Illustration of Dense Stand of Pteridium aquilinum and Rubus fruticosus in Glade Areas (foreground of photograph)

The herb layer comprised Polystichum setiferum, Veronica chamaedrys, Holcus lanatus, Epilobium montanum, Dryopteris dilatata, Epilobium hirsutum, Epilobium montanum, Lapsana communis, Viola riviniana, Bromopsis ramosa, Phyllites scolopendrium, Geum urbanum, the orchid Listera ovata (ca. 20 stems), and the mosses Eurhynchium praelongum and Thamnobryum alopecurum. The herb layer showed signs of nutrient enrichment and disturbance in places as indicated by the presence of such herbs as Aegopodium podegraria, Heracleum sphondylium, Urtica dioica, Arctium minus, Galium aparine and Convolvulus arvensis. There were extensive carpets of ivy in places. The leaning trunks of the trees supported the moss Isopterygium elegans. The herb layer was somewhat grass-dominated in places consisting of Poa trivialis and Holcus lanatus intermixed with Ranunculus repens and Geranium robertianum with occasional Viola riviniana.

Grassland Habitats

The grassland habitats identified on site have been characterised as:

- GS4 – Wet Grassland
- GS2 – Dry Meadows and Grassy Verges
- GM1 – Marsh

Species-rich **Wet Grassland (GS4)** (*Figure 10.3*) of high conservation value occurred **[(T7) (Grid reference H 93316 02240]** in the lower damper parts of the site with a species composition of the rushes *Juncus effusus* and to a lesser extent *Juncus acutiflorus*, along with *Carex diandra, Carex flacca, Carex rostrata, Lotus pedunculatus, Lotus corniculatus, Filipendula ulmaria, Anthoxanthum odoratum, Epilobium parviflorum, Galium palustre, Ranunculus acris, Angelica sylvestris, Dactylorrhiza maculata, Potentilla erecta, Stellaria graminea, Plantago lanceolata, Holcus lanatus, Rumex acetosa, Centaurea nigra, Veronica chamaedrys, Hypericum tetrapterum, Cynosuros cristatus, Senecio jacobaea, Cerastium fontanum, Equisetum palustre, Luzula multiflora, Rhinanthus minor, Lathyrus pratensis, Trifolium pratense, Cardamine pratensis, Mentha aquatica, Cirsium palustre,* and the moss *Calliergonella cuspidata*. Alder is spreading into the wet grassland from the wet woodland at its edges, suggesting a relaxation of grazing pressure in recent years. The wet grassland forms a mosaic with dense *Crataegus monogyna, Sambucus nigra* and *Ulex europaeus* **Scrub (WS1)** in places. The dense shade cast by the scrub precludes the development of a diverse herb layer below the canopy. The scrub appears to be relatively recent in origin and has probably spread in recent years over the grassland habitats due to a relaxation in grazing pressure and thereby having the effect of shading out the characteristic grassland species of interest.

Figure 10.3 Illustration of Species Rich Wet Grassland

There is another large open area of wet grassland **(T8) at Grid ref. H 93358 02265** with a species composition of Juncus effusus, Holcus lanatus, Dactylis glomerata, Festuca rubra, Trifolium pratense, Anthoxanthum odoratum, Centaurea nigra, Potentilla anserina, Carex hirta, Ranunculus acris, Filipendula ulmaria, Cerastium fontanum, Rumex acetosa, Prunella vulgaris, Lotus corniculatus and Luzula campestris.

At **Grid ref. H 93429 02208** is a small area of species-poor wet grassland ('rush pasture') **(T9)** consisting of dense tussocks of Juncus effusus with the occasional Rumex acetosa and Potentilla anserina. The poor species diversity in this area may indicate localised nutrient enrichment of the wet grassland sward. This small area of species-poor wet grassland grades into a more species-rich wet grassland sward **(T10) (Grid ref. H 93450 02124)** with a species composition of Rumex acetosa, Anthoxanthum odoratum, Potentilla anserina, Festuca rubra, Trifolium repens, Agrostis stolonifera, Holcus lanatus, Senecio jacobaea, Plantago lanceolata, Carex diandra, Hypochaeris radicata, Filipendula ulmaria, Lathyrus pratensis, Lotus uliginosus, Potentilla erecta, Poa trivialis, Trifolium pratense, Stellaria graminea, Taraxacum officinale agg., Vicia cracca, Prunella vulgaris, Rhinanthus minor, Cirsium palustre, Hypericum tetrapterum, Vicia sepium, Veronica chamaedrys, Centaurea nigra, Luzula multiflora, Luzula campestris, Ranunculus acris, Angelica sylvestris and the mosses Pseudoscleropodium purum and Rhytidiadelphus squarrosus. Pilosella officinarum forms extensive mats on small limestone rocks protruding above the grassland sward. The wet grassland in this area grades into dense scattered scrub at intervals consisting of dense Rubus fruticosus agg., Sambucus nigra, Pteridium aquilinum, Ulex europaeus and Crataegus monogyna. The scrub is locally nutrient-enriched as evident by the presence of dense stands of nettle in more open areas between the shrubs but potentially provides good bird nesting habitat.

Another area of relatively species-rich wet grassland **(T11)** occurs at **Grid ref. H 93715 02135.** This was observed to have a species composition of Anthoxanthum odoratum, Juncus effusus, Filipendula ulmaria, Carex diandra, Luzula multiflora, Luzula campestris, Mentha aquatica, Cirsium palustre, Festuca rubra, Agrostis stolonifera, Rumex acetosa, Veronica chamaedrys, Potentilla anserina, Carex flacca, Holcus lanatus, Senecio jacobaea, Centaurea nigra, Cardamine pratensis, Hypericum tetrapterum, and Hydrocoyle vulgaris.

Rank wet grassland **(T12)** also occurs at **Grid ref. H 93267 02143** with a species composition of Holcus lanatus, Poa pratensis, Festuca pratensis, Urtica dioica, Rumex acetosa, Filipendula ulmaria, Anthoxanthum odoratum, Lathyrus pratensis, Rumex acetosa, Poa trivialis, Juncus effusus, Vicia sativa, and Equisetum palustre grading into Salix aurita scrub and stands of Betula pubescens to the north.

The grassland habitat **Dry Meadows and Grassy Verges (GS2)** occurs towards the site edges on better drained higher ground **(T13-15) (Grid references H 93396 02265, H 93660 02047, and H 93512 02158 respectively).** It tended to be much ranker than the adjacent areas of wet grassland. The main species in the sward included Holcus lanatus, Dactylis glomerata, an occasional patch of Lolium perenne, Ranunculus repens, Centaurea nigra, Poa trivialis, Bromopsis ramosa, Cerastium fontanum, Alopecurus pratensis, Trifolium pratense, Festuca rubra, Rumex acetosa, Plantago lanceolata, Lotus uliginosus, Hypochoeris radicata, Veronica chamaedrys, Stellaria graminea, Senecio jacobaea, Lathyrus pratensis, and Lotus corniculatus. The sward is nutrient-enriched in places as indicated by the presence of Cirsium arvense, Heracleum sphondylium, Galium aparine, and extensive patches of Urtica dioica owing to past ingress of cattle. Relatively recent disturbance to the sward is indicated by grassed over tractor ruts. The grassland forms a mosaic with scattered scrub consisting of Rubus fruticosus, Sambucus nigra, Pteridium aquilinum, Crataegus monogyna and Ulex europaeus. The scrub recent in origin possessing a limited herb layer below the shrub canopy but nevertheless comprising Veronica chamaedrys, Rumex obtusifolius, Viola riviniana, Rumex sanguineus and Epilobium montanum.

10.4.2 Fauna

Mammals

ERM staff gathered evidence of mammalian activity within and adjacent to the site during the detailed ecological surveys undertaken in late May.

The results of this survey concluded that the site was suitable for supporting badger (*Meles meles*), Irish hare and foraging bat species but contained no suitable habitat for other mammals such as otters (*Lutra lutra*) and Irish stoat (*Mustela erminea*). No records of red squirrels (*Sciurus carolinensis*), pine marten (*Martes martes*) or hedgehogs (*Erinaceus europaeus*) were noted during the field surveys. The lack of artificial structures on site decreased the potential for the site to support roosting bat species. However, the site contains a number of mature trees which are considered to have the potential to support bat species. Also the wet grassland and woodland habitats are ideal foraging areas for bat species and it is assumed that a range of bat species utilise the various habitats on site as a food resource.

Evidence of badger activity was recorded on site. A latrine was recorded on an exposed rock at **Grid ref H 93623 02062.** An inactive badger sett was identified to the north of the wet woodland habitat to the east of the site. Badgers and their setts are protected under the Wildlife Act 1976 and the Wildlife Amendment Act, 2000.

An Irish hare was recorded in the pasture field to the north of the site.

Birds

The site supports a range of bird species and is considered to be an important habitat for breeding birds. It is also likely to support a number of winter migrant species. All birds, unless mentioned otherwise are protected under the Wildlife Act, 1976 and the Wildlife Amendment Act, 2000. The following birds were recorded on site:

- Sedge warbler
- Willow warbler
- Blackbird
- Chiffchaff
- Songthrush
- Wren
- Robin
- Long-tailed Tit
- Coal tit
- Blue tit
- Great tit
- Bullfinch
- Greenfinch

- Wood pigeon
- Pheasant
- Swallow
- Rook
- Magpie (not protected under the Wildlife Act, 1976, as amended.)
- Buzzard

10.4.3 Invertebrates

The site supports a diverse range of terrestrial invertebrates. Six butterfly species were recorded on site. These include speckled wood, common blue, small copper, wood white, large white and orange tip. The habitats on site are ideal for supporting a range of Odonata species. Large Red Damselfly (*Pyrhosoma nymphula*) and azure damselfly were recorded over marsh habitat at the edge of the alder carr and throughout the scrub habitat to the east of the site. Other species of damselfly and dragonfly, which do not emerge until later in the summer season, are likely to be present on site. Other aerial invertebrate species include the crane fly, common garden bee, red-tailed bumble-bee and buff-tailed bumble-bee.

The site also supports a range of surface dwelling invertebrates such as carabids and gastropods. The button ramshorn snail (*Anisus leucostoma*), which has a restricted distribution in Ireland was recorded in the fen habitats within the wet woodland. The common field grasshopper (*Chorthippus brunneus*) was recorded with the dry heath and scrub habitats. No protected invertebrate species were recorded on site.

Protected terrestrial invertebrate species occurring in Ireland include the Marsh Fritillary butterfly and the three whorl snail (*Vertigo spp.*) species. The Marsh Fritillary (*Euphydryas aurinia*) butterfly is associated with peat bog/grassland habitats in Ireland, with significant stands of its foodplant *Succissa pratensis*. No *S. pratensis* was recorded on site during the survey. Adult butterflies are typically on the wing in late May early June. However, no adult butterflies were recorded during the field survey.

As there are no historical records of any of the Annex II listed *Vertigo* species occurring within the 10 kilometre square grid in which the proposed site is located *(Kerney, 1976, 1999),* no targeted conchological survey for these species were undertaken.

10.4.4 Amphibians

A large population of common frog was recorded throughout the site. The common frog is a protected species listed under Annex V of the E.U. Habitats Directive.

10.5 Site Evaluation

The site as a whole, by virtue of the complex mosaic of habitats present, particularly the Wet Woodland (alder/willow carr) (WN6) and associated fen communities (PF1), Mixed Broadleaved/conifer Woodland (WD2), Wet Grassland (GS4), Marsh (GM1) and dense scattered Scrub (WS1) is of local nature conservation importance consisting of a ‘stepping stone’ of largely semi-natural wildlife habitats within an often agriculturally improved area that allows for the free movement of biodiversity through the local landscape.

Although no rare species were recorded on the site, it is the combination of a diverse suite of native species typical of these habitats that defines them as being in a high state of naturalness and therefore of high conservation value. According to the NRA Site evaluation criteria the site is considered to be of *high value* and *locally important*.

The complex mosaic of habitats such as is found on this site supports a high diversity of species within different faunal groups namely invertebrates and birds (including buzzard that may be breeding on the site). Currently the site is known to support a diverse avifauna, a large frog population, several butterfly species and a number of damselfly and dragonfly species.

In addition, individual patches of some of the habitats notably the Wet Woodland (alder/willow carr) (WN6) and associated fen communities and the extensive areas of species-rich Wet Grassland (GS4) approach Natural Heritage Area quality.

The Wet Woodland (WN6) is representative of its type and is in a high state of naturalness with a diverse herb flora colonising old drains and peaty hollows throughout the woodland including typical quality fen/marsh species namely *Filipendula ulmaria, Equisetum fluviatile, Carex rostrata, Galium palustre, Potentilla palustris, Hydrocotyle vulgaris, Carex nigra, Eriophorum angustifolium, Carex demissa, Berula erecta, Potentilla palustris* and large tussocks of *Carex paniculata.*

The Mixed Broadleaved/conifer Woodland (WD2) largely consists of non-native woody species, with the trees being around 150-200 years old. This habitat is nutrient enriched and disturbed in places resulting in an impoverished herb flora on account of run-off from the surrounding agricultural land. The understorey of this woodland is reasonably well-developed in places contributing to well-structured woodland. Forest structure refers to the vertical arrangement of woodland layers – a diverse structure provides many more ecological niches to suit a wider range of species than woodland lacking vertical layers at its edges or internally. Good forest structure is particularly important for invertebrates and breeding birds. The habitat is considered to be of moderate ecological value, locally important.

The Birch, *Betula pubescens,* woodland on drier areas within the wet woodland towards the southern edge of the site is poorly structured while the dense field layer of bramble below the birch canopy can denote nutrient enrichment. The bramble itself has the effect of shading out typical native woodland herbs. The small pockets of birch woodland however do add to the habitat diversity of the site that in turn increases faunal species diversity. This habitat is considered to be of moderate ecological value, locally important.

There is extensive relatively young Scrub (WS1) on the site forming a mosaic with the two grassland habitat types. The scrub in general however does not support a high diversity of typical woodland species owing to its relatively young age and secondly owing to localised nutrient enrichment, probably a consequence of past ingress by cattle. Nevertheless the scrub habitat does support a range of bird and invertebrate species. This habitat is considered to be of moderate value, locally important.

The Wet Grassland (GS4) on lower ground adjoining the wet woodland has a relatively high species diversity including a number of sedges indicative of high quality habitat. This habitat is of high value, locally important. Nevertheless scrub is actively encroaching on this habitat, indicating a reduced grazing pressure in recent years. The scrub encroachment is, and will continue to have, the effect of reducing the species diversity of the sward by shading out the characteristic wet grassland species. If the site is left in an unmanaged state, with no grazing regime the scrub habitat will continue to colonise and thus deplete the grassland areas.

On drier higher ground the rank Dry Meadows and Grassy Verges (GS2) habitat is locally nutrient-enriched resulting in a reduction in the species diversity of the sward of lower conservation value than the wet grassland on the site. This grassland type like the wet grassland is also scrubbing over and in time this will shade out the characteristic grassland species. If the site is left in an unmanaged state, with no grazing regime the scrub habitat may continue to colonise and thus deplete the grassland areas. The dry meadows and grassy verges habitat is of moderate value, locally important.

10.6 Description of Predicted Impacts

The potential impacts of the proposed development were examined in the context of the findings of the ecological baseline outlined above. This included an assessment of the potential direct and indirect impacts to the ecological baseline identified within and adjacent to the site.

10.6.1 Evaluation Criteria

The potential for ecological and nature conservation impacts has been assessed in the light of habitats and the species that will be affected by the proposals in line with the EPA's *Guidelines for Environmental Impact Statements* and the IEEM's *Guidelines for Ecological Impact Assessment* and the National Roads Authority's *Guidelines for Assessment of Ecological Impacts of National Roads Schemes.*

As part of the Ecological Impact Assessment (EcIA) the significance of potential ecological impacts has been evaluated taking into account the following factors:

- the magnitude of both positive and negative effects, as determined by intensity, frequency and by the effect extent in space and time;
- the duration, frequency and reversibility of the impact;
- the vulnerability of the habitat or species to the change caused by the development;
- its ability to recover, considering both fragility and resilience;
- the viability of component ecological elements and the integrity of ecosystem function, processes and favourable condition;
- value within a defined geographic frame of reference (e.g. national, regional or district);
- the biodiversity value of affected species, populations, communities, habitats and ecosystems, considering aspects such as rarity, distinct sub-populations of a species, habitat diversity and connectivity, species-rich assemblages, and species distribution and extent; and
- designated site and protected species status.

Significance was determined by the interaction of these primary criteria with the biodiversity value of ecological receptors. The value of the affected feature is used to determine the geographical scale at which the impact is significant. Impacts in relation to their residual effect on each ecological receptor is outlined, after taking into account the potential significance or the impact, zone of influence, mitigation measures and the confidence in predictions associated with the EcIA. The nomenclature employed for the assessment of impacts to habitats is sourced from the Appendix 4 of the National Roads Authority's *Guidelines for the Assessment of Ecological Impacts of National Road Schemes*. This nomenclature is directly related to the Site Evaluation Scheme outlined in *Table 10.1* above and provides an accepted nomenclature for the assessment of ecological impacts. The standard EPA nomenclature is used for the assessment of impacts to species.

10.6.2 General Impacts

General impacts associated with the proposed development will include the following:

- Permanent loss of habitat or species due to permanent or temporary land take;
- Disturbance to, or displacement/exclusion of a species from foraging habitat due to land take, construction activities, operating and maintenance activities;
- Creation of barriers to the movements of animals, especially mammals, amphibians, invertebrates and plants with limited powers of dispersal, resulting in the potential isolation of populations; and
- Fragmentation of habitat or severance of wildlife corridors, particularly hedgerows and treelines, between isolated habitats of ecological importance.

Specific construction impacts associated with the proposed development will include:

- Impacts on species caused by permanent alterations in night time light conditions;
- Temporary negative impacts upon habitats adjacent to the site or to be retained within the site; and
- Temporary negative impacts to fauna resulting from disturbance to habitats, increases in noise, vibration and light levels, and the presence of people.

Specific operational impacts associated with the proposed development will include:

- Disturbance or damage to adjacent habitats and species caused by the movement of vehicles and personnel, artificial lighting, dust, spillage of fuels and chemicals and noise;
- Degradation of habitat quality and adverse impacts to species due to airborne emissions from the power plant. The results of detailed air quality modelling analysis have shown that the annual mean NO_x deposition to the site and surrounding area will not exceed 4.5µg/m^3, which is 15% of the air quality limit of 30 µg/m^3 for the protection of vegetation, (as specified in the Air Quality Standards Regulations, 2002). Therefore it is anticipated that the ecological effects of aerial deposition of nitrogen will be neutral.
- Impacts on habitats caused by alterations to drainage regimes; and
- Impacts to species caused by permanent alterations in night time light conditions.

10.6.3 Designated Conservation Areas

Dundalk Bay cSAC

The proposed development will not directly impact upon the Dundalk Bay cSAC, which is located approximately 12 kilometres to the east of the site. There will not be any direct or indirect impacts on any of the pNHAs or SPAs located within a 10 kilometre radius of the site. It is proposed that an outfall be located along the Glyde River to dispose of waste water derived from the site. The ecological impact of discharge of waste water to the Glyde River is discussed in *Section 13.5.3* of this EIS.

10.6.4 Permanent Impacts on Habitats & Species

The proposals set out in *Chapter 3* will result in the loss of a significant proportion of the following habitats:

- Wet Woodland WN6

- Broadleaved/Coniferous Woodland WD2;
- Scrub WS1;
- Wet Grassland GS4; and
- Dry meadows & grassy verges GS2.

The proposal will result in the loss of all the wet grassland habitats of high ecological value on site.

While the occurrence of dry meadows and scrub habitats are widespread throughout the Louth countryside the presence of wet woodland and species-rich wet grassland habitats is limited, and therefore any reduction in these habitats will constitute a major adverse impact.

As outlined in the baseline section of this chapter the extent of the wet woodland habitat recorded on site is divided into two distinct areas, occurring to the west and east of the site. The mosaic of small patches of a mix of valuable habitat types within a comparatively small area contributes to a relatively higher cumulative ecological value of the area. While a small portion of the wet woodland habitat to the west of the site will be retained, the majority of this portion of wet woodland, and particularly the micro habitats supported within it, will be lost permanently as a result of the proposed development. This will have a permanent and major impact upon the local ecological resource. The wet woodland to the east of the site will not be directly altered by the proposed development.

As outlined above the majority of the broadleaved/coniferous woodland of the proposed site will be lost as a result of the proposed development. This habitat is of moderate ecological value and, as such, the potential impact of the proposed development will have a permanent, moderate impact upon the ecological resources of the local area.

Scrub habitats occur along the boundary of the site and also within the site. While the areas of scrub occurring within the site will be lost as a result of the development, the scrub boundary will be retained to the west and south of the site. The loss of scrub habitat will result in a moderate, permanent, impact.

The wet grassland habitat will be directly impacted by the proposed development. The area currently covered by this habitat will be converted to built land. As this habitat is considered to be of high ecological value and local conservation importance, its loss will constitute a major, permanent impact upon the ecological resource of the local area

The loss of the dry grassland as a result of the proposed development will have a moderate impact.

10.6.5 Impacts to Terrestrial Fauna

Mammals

As outlined in *Section 10.4.2* above badger activity was recorded within the site, with an inactive sett located to the east of the site in the area of WN6 and paths and a latrine recorded within the scrub habitats to the centre of the site. While the proposed land use changes will reduce the foraging resource for badgers within the site, the occurrence of extensive areas of agricultural grassland, some of which is semi-improved, adjacent to the site will ensure that a substantial foraging resource will persist within the local area for any badger populations. The sett located to the east of the site will not be impacted by the proposed development.

The proposal will have a slight impact upon the local badger population.

While no detailed bat survey was undertaken during baseline surveys it is considered that the site provides ideal foraging conditions for a range of bat species. As the woodland, wet grassland, and scrub habitats support a high diversity of invertebrate fauna, any loss of these habitats will have a negative impact upon the bat foraging resource within the local area.

The site also contains a number of mature deciduous trees. An assessment of the capacity of these trees to accommodate bat species was undertaken during the field survey. It was concluded that a number of mature trees, along the northern boundary of the site may have the potential to support roosting bats. As all bats, their roosts sites and foraging areas are protected under national and European legislation, any loss of bat tree roosts or foraging habitat will have a potentially significant, negative impact upon the local bat population.

Also, the introduction of artificial lighting during the construction and operation phase of the proposed development may adversely impact bat foraging behaviour.

No other mammal species were recorded within, or adjacent to, the proposed site.

Birds

The data obtained during the surveys associated with the EcIA suggests that the proposed site may be of significant local importance for the range of bird species supported within it. While wild birds (with certain exceptions) are protected under national legislation, no birds recorded on site are protected under European legislation. Birds may be impacted by the development through the loss of feeding and nesting habitats, and by increased disturbance, particularly during construction of the proposed power plant. During operation there may also be a decrease in breeding success for songbirds close to the plant due to operational noise levels. The potential disturbance to birds and loss of habitat will have a moderate negative impact.

Invertebrates

The site supports a range of terrestrial invertebrates. Up to five species of butterfly and two damselfly species were recorded during the field survey. It is considered that the site supports a range of lepidoptera and odonata over and above that recorded during the field surveys. None of the species recorded or likely to be present on site are protected under national or European legislation. It is considered from the simple, qualitative field surveys undertaken for invertebrates that the wet woodland, and associated fen and marsh micro-habitats and the wet grassland are the most important habitats on site for supporting invertebrate communities. The loss of the wet grassland and the partial loss of wet woodland on site will have a significant impact upon the invertebrate communities associated with this habitat. However, the retention of the wet woodland to the east of the site will mitigate any overall impact to this faunal group.

Amphibians & Reptiles

A dense population of common frog was recorded on site. Common frogs are protected under national and European legislation (EU Habitats Directive). Frogs were principally recorded within the wet grassland and wet woodland habitats. The ponded drainage ditches provide ideal breeding habitat, while the broadleaved/coniferous woodland are likely to provide ideal potential hibernating habitat for common frogs on site. While the functional value of this habitat for supporting populations of common frogs will be permanently lost as a result of the proposed development, the retention of the wet woodland habitat to the east of the site, and areas of open surface water during the field survey, will continue to provide ideal habitat for common frogs.

Nevertheless, as the extent of habitat supporting common frogs on site will be reduced, it is considered that this in turn will cause a reduction in the population of common frogs. The overall impact to the population of common frogs will be significant.

No other amphibians, or reptiles, were recorded on site.

10.7 Mitigation Measures

The findings of the baseline surveys were used to help identify likely impacts of the proposed development on ecological resources. These impacts have been outlined above. Based on these findings, mitigation measures were developed and incorporated into the design to help avoid or reduce these impacts. The assessment of residual impacts which follows this section assumes that the following measures will be successfully implemented.

- The contractors will be required to agree method statements with the National Parks and Wildlife Service (NPWS) for all construction activities in or adjacent to ecologically sensitive areas to be retained on site i.e. the area of wet woodland to the east of the site and for restoration proposals as part of the Construction Environmental Management Plan (CEMP). The adoption of best practise to minimise wildlife impacts is considered to be essential in the construction of the proposed power plant on this site. Several best practise guidelines exist, some of the most useful being provided by the NRA including Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes should be adhered to.
- Habitat loss will be limited to the minimum needed for safe implementation of the works.
- Design mitigation was undertaken to retain a vegetated corridor to the south and west of the proposed site and the wet woodland to the east of the site.
- The contractor will ensure that best practice measures are adopted to avoid incursion into the site or any secondary affects from pollution, draining of adjacent wet habitats etc. Sensitive habitats will be taped off to prevent incursion during construction.
- While no direct evidence of bat activity was observed it is recommended that a survey for potential bat tree roosts should be undertaken prior to site clearance. If bat trees roosts are confirmed to be present on site, the contractor will submit a method statement for their removal and obtain appropriate licences from the NPWS prior to the removal of any tree roosts. The felling of any bat trees on site should take place during the months of October and November. Compensatory bat boxes will be installed in the event that bats are encountered. The number of which will be determined by the survey in agreement with NPWS.
- A survey for badger setts should be undertaken prior to site clearance. If badger setts are recorded within the proposed site, the contractor will submit a method statement for their removal and obtain appropriate licences from the NPWS prior to the removal of any badger setts. If badger setts are recorded adjacent to the proposed site, the following construction criteria should be adhered to:

- No heavy machinery should be used within 30 metres of a badger sett (unless otherwise permitted to under licence by the NPWS);
- Lighter machinery should not be used within 20 metres of a sett entrance; and
- Light work, such as digging by hand or scrub clearance should not take place within 10m of sett entrances.

- Wherever possible and in accordance with the requirements of the Wildlife Act 1976 (as amended in 2000) habitat removal i.e. trees, will take place outside the main period of the breeding bird season (approximately mid March to the end of July) to avoid effects on nesting birds. Where this is not possible, all potential nesting habitat that will be disturbed, will be checked for nesting birds before removal. If any nesting species are identified, appropriate mitigation measures will be agreed and implemented in consultation with NPWS. Mitigation measures should include the installation of compensatory bird boxes within the habitats retained on site. The number of which will be determined by the survey in agreement with NPWS.
- Temporary work areas, including site accesses, will be situated on areas of existing hard standing or areas of low conservation value.
- Any disturbance to or translocation of common frogs on site should be undertaken only under licence from the NPWS.
- Access tracks to and from the site will be defined prior to the commencement of site clearance. Site clearance and construction vehicles will be restricted to these tracks to avoid impacting upon adjacent vegetation and to ensure that soil compaction is restricted to these tracks.
- Any topsoil and subsoil, to be reinstated after the site clearance /construction process will be stripped and stored separately in low mounds. Top soil mounds should not exceed two metres. Soils should be reinstated as soon as possible, to minimise adverse impacts to the soil structure and the seed bank within it. Topsoil (and the seed bank it contains) to be reused should be replaced as close as possible to the location from which it was taken, and to the approximate original depths.
- A post construction Restoration Statement of habitat impacted temporarily by the construction phase but not permanently lost to the footprint of the site should be drawn up as part of the CEMP in consultation with the NPWS before commencement of construction. Restoration of such habitats should be progressed at the earliest available possibility so as to minimise soil storage times.
- A Habitat Management Plan will be developed in discussions with the NPWS and Louth County Council Heritage/Biodiversity Officer.
- A landscaping plan is proposed to assist in screening the power plant. The landscaping plan should include planting native trees/plants to complement the biodiversity in an area. The landscaping plan should increase the biodiversity value of the natural habitats retained on site
- The design of the power plant should consider the need to maintain good drainage and natural water flows within the area surrounding the site to minimise flood risk and to protect the remaining wet woodland habitat. Sustainable Urban Drainage solutions should be incorporated into the design of the power plant to deal with surface water run off. A SUDs approach would meet good practise and would offer significant habitat recreation and enhancement possibilities.

10.8 Residual Impacts

Despite the implementation of the mitigation measures outlined above, residual negative impacts will be associated with the proposed development. The residual impacts to habitats are outlined in *Table 10.2* below. Residual impacts to terrestrial fauna includes the loss of foraging habitat and potential tree roosts for bats, the loss of breeding, hibernating and foraging habitats for common frogs, the loss of roosting and breeding habitat for bird species and the loss of breeding and foraging habitat for invertebrate communities. While there will be significant negative impacts to the fauna and flora species supported within the site, it is considered that the residual impacts in the wider local context for fauna will be as follows:

Moderate impacts to bat species. The retention of the wet woodland to the east of the site and the enhancement of this habitat with bat boxes will ensure that the site, (as well as the surrounding countryside) will continue to support bat populations within the local area. Nevertheless a significant foraging area is be lost as part of the proposed development.

Significant impacts to common frogs. The wet woodland and wet grassland area to the west of the site constitutes a significant resource for the common frog population within the local area. As only two further areas of wetland habitats, (one of which is to be retained on site) exist in the wider local area, the loss of potential breeding sites in any one of these three areas represents at least a moderate negative impact for the local frog population. Provided robust management of the retained wet woodland is undertaken, this impact, may overtime, be reduced to a moderate impact.

Slight impacts to birds. The site represents a significant resource for the range of bird species occurring in the local area. The mosaic of habitats occurring within the site increases the functional value of the habitat to support bird species. The ornithological interest of the site is also significant due to the resident pair of buzzards located within the site. While the loss of the habitat mosaic and functional value represents a moderate impact for bird species, the enhancement of the wet woodland to the east of the site for supporting birds and the identification or creation of an alternative buzzard roost will mitigate the impacts to birds, so that the residual impacts will be initially moderate but with good site management may be reduced to slight.

Overall, the proposed development will have a major negative impact upon the ecological resources of the proposed site. The retention, enhancement and ongoing management of the wet woodland mosaic represent an opportunity to safeguard an area of high ecological value for the long-term future so that a portion of the site will continue to support biodiversity within the local area.

Table 10.2: Residual Ecological Impacts to Habitats

Habitat	Evaluation	Predicted Impact	Mitigation	Residual Impact
Wet Woodland (West of Site)	High Ecological Value, Locally Important	Major, permanent, negative impact	No direct mitigation to this area of wet woodland is possible. However the inclusion of the wet woodland to the east of the site within the site boundary will safeguard a representative area of this habitat.	Significant, permanent, negative impact
Scrub	Moderate Ecological Value, Locally Important	Moderate, permanent, negative impacts.	No direct mitigation to this habitat is possible within the confines of the site.	Moderate, permanent, negative impacts.
Broadleaved Coniferous Woodland	Moderate Ecological Value, Locally Important	Moderate, permanent, negative impacts.	The construction method statement will outline sections of this habitat that are to be retained. Areas to be retained will be fenced off so that the woodland vegetation is not impacted during construction. Nevertheless the majority of this habitat will be lost as a result of the development.	Moderate, permanent, negative impacts.
Wet grassland	High Ecological Value, Locally Important	Major, permanent, negative impacts	No direct mitigation to this habitat is possible within the confines of the site.	Major, permanent, negative impact
Dry Meadow and Grassy verges	Moderate Ecological Value, Locally Important	Minor, permanent, negative impacts	While no mitigation measures can be undertaken to reduce the impact of the proposed development on this habitat, the moderate value and the prevalence of this habitat type in the surrounding countryside reduces the overall impact of the loss of this area within the proposed site.	Minor, permanent, negative impacts.

10.9 Limitation Encountered During the Assessment

The principal limitation encountered during the assessment was the establishment of the faunal baseline. While the field surveys were undertaken in early and late May, a complete appreciation for the presence and distribution of certain invertebrate species could not be recorded due to seasonal constraints. As many lepidoptera and odonata species are not active until later in the summer a complete list of these species is not provided as part of the baseline assessment.

Furthermore, no assessment of the interaction between the ecological resource and the hydrological regime was undertaken for the EcIA. The hydrological regime of wet woodlands is considered to be the over-riding abiotic factor influencing species composition (*Kelly & Iremonger, 1997*). It is acknowledged that any adverse impacts to the existing hydrological regime may have adverse consequences for the ecological resources retained on site.

10.10 Summary Conclusion

Ecological surveys conducted on the proposed site have identified it as being an area of high ecological value of local importance. A mosaic of valuable habitat was identified including wet woodland and wet grassland. Extensive consultations were subsequently conducted with National Parks and Wildlife Service (NPWS), the government department charged with the conservation of habitats and species in Ireland, regarding the implementation of appropriate mitigation measures to minimise the impact of the development on the ecology of the area (refer to *Appendix 1.2*). It was agreed that a significant portion of the land, equating to 22%, would be retained in its natural state as a mitigatory measure. The land in question stretches from the western boundary around the southern boundary and incorporates an area of wet woodland to the east of the site.

Overall it is considered that the development will have a significant impact on the ecological resources of the proposed site. However, the measures described will mitigate the impact of the development in part providing an opportunity to support biodiversity within the local area.