

17.0 INTERACTIONS

In accordance with the requirements of EC Directive 85/337/EC (as amended) and Environmental Protection Agency (EPA) "Guidelines on the Information to be contained in Environmental Impact Statements" and "Advice Notes on Current Practice in the Preparation of Environmental Impact Statements", published in 2002 and 2003 respectively, the interactions between various environmental factors must be completed as part of the environmental impact assessment.

The impacts and likely significant effects on the interaction between any of the following environmental media are discussed below:

- human beings
- flora and fauna
- soils and groundwater
- surface water
- air
- noise
- climate
- material assets and
- the landscape

Table 17.1 presents a matrix of interactions likely to occur from the proposed development (highlighted in green). The level of interaction between the various media will vary greatly but the table allows the interactions to be identified and detailed where necessary. If the development does not have the potential to impact or affect the interaction then that interaction is not highlighted in green.

The interaction matrix is based on the potential interrelationships of the environmental media both during the construction and operation phases of the proposed development. Details of individual interactions are presented in Section 17.1.

Table 17.1 Interactions between Environmental Media

	Human Beings	Air	Noise	Landscape	Flora & Fauna	Hydrology	Ground-water	Soils & Geology	Climate	Material Assets	Roads & Traffic	Cultural Heritage
Human Beings												
Air												
Noise												
Landscape												
Flora & Fauna												
Hydrology												
Ground-water												
Soils & Geology												
Climate												
Material Assets												
Roads & Traffic												
Cultural Heritage												

17.1 HUMAN BEINGS

Upon evaluation of all environmental topics, landscape, air, flora and fauna, roads and traffic and noise have been identified as topics which interact with human beings. In particular these interactions would occur during construction activities as a direct result of earth works associated with installation of foundations and tank structures resulting in the generation of noise and dust. However, as outlined in Section 6 (Landscape), Section 11 (Air), Section 10 (Flora & Fauna), Section 13 (Noise) and Section 14 (Roads and Traffic) the development would have the potential of a negative impact if construction activities were to proceed without implementing adequate mitigation measures. The landscape, air, flora and fauna, roads and traffic and noise sections recognise the importance of protecting these resources from potential damage during the construction phase and have made recommendations regarding mitigation measures to prevent negative impacts. Health and Safety on site is also recognised as being of paramount importance to human beings during the construction and operation phases and this will not be compromised, if the specified mitigation measures outlined in the various chapters of the EIS are adhered to.

17.2 AIR QUALITY

17.2.1 Air Quality and Human Beings

There is potential for impact to human beings living in the area of the proposed development during the construction and operation phases of the development. These have been outlined and assessed in Chapter 11 of the EIS. The air quality impact at the nearest residential receivers is predicted to be below the relevant air quality standard limit values and is therefore determined to be low.

17.2.2 Air Quality and Flora and Fauna

The main interactions between air quality and flora and fauna are related to emissions of acidifying gases such as nitrogen oxides (NO_x) and sulphur dioxide (SO₂) from the development. These emissions will not have any significant adverse impact on the receiving environment as maximum ground level ambient annual mean NO_x concentrations directly due to process emissions are approximately 11% of the annual mean limit value for the protection of vegetation. At the nearest sensitive ecological receptors, i.e. Lough Boora pNHA located approximately 3km to the south east of the site and the Grand Canal pNHA located approximately 3km to the north of the site, the ambient annual mean NO_x concentrations directly due to process emissions are <1% of the annual mean limit value. At the Moyclare

Bog and Ferbane Bog Special Areas of Conservation (SAC) located approximately 7km to the north east of the proposed development site the ambient annual mean NO_x concentrations directly due to process emissions will be insignificant. Sulphur dioxide emissions from the combustion of natural gas are insignificant.

17.2.3 Air Quality and Climate

At present, with emissions of 16.933 tonnes per capita, Ireland has the second highest CO₂ emissions per capita of the 27 countries in the European Union (Carbon Action Ireland). The first phase of the Kyoto Protocol is from January 2008 until December 2012 and during this five year period Ireland has legally committed to limit it's emissions to a combined total of 315 million tonnes of CO₂ or 63 million tonnes per year. However, in 2007 Ireland emitted 69.28 million tones of CO₂. Carbon dioxide emission for the country as a whole can be significantly reduced by converting our conventional fossil fuel power plants to state of the art gas fired power plants and supplementing this with renewable energy supplies such as local wind farms. The proposed gas fired power station will result in significant CO₂ emission reductions when compared to alternative conventional fossil fuel generation plants such as coal fired or oil fired plants.

17.3 NOISE

17.3.1 Noise and Human Beings

The main interactions with noise are in relation to human beings and flora and fauna. The impact of noise on the human beings living in the area of the proposed development has been addressed during the construction and operational phase of the proposed development. This has been outlined in Chapter 13 of the EIS. The noise impact at the three nearest residential receivers is predicted to be below the EPA noise limits of 55dB L_{Ar,T} during daytime (8am to 10pm) and 45 dB L_{Aeq,T} during night time (10pm to 8am).

17.3.2 Noise and Flora and Fauna

In relation to the interaction of noise from the proposed development with flora and fauna, the noise generated by the development will not have a significant adverse impact on the local birdlife and wildlife. Local birdlife and wildlife will quickly accustom to any change in the noise climate of the area as occurs throughout the country. Noise levels generated during the operation of the proposed development will not be audible at the nearest sensitive ecological receptors, i.e. Lough Boora (pNHA) located approximately 3km to the south east of

the site, the Grand Canal (pNHA) located approximately 3km to the north of the site, the Moyclare Bog and Ferbane Bog (Special Areas of Conservation (SAC)) which are located approximately 7km to the north east of the proposed development site.

17.4 LANDSCAPE

The landscape and visual impacts have potential interactions with impacts resulting from other environmental statement topics. The interactions of these impacts are usually highly complex in practice and this section serves to act as a brief overview to these issues. In addition, the proposed development will create varying impacts during the construction phase and the operation phase.

17.4.1 Landscape and Traffic

During the operation phase, the traffic volumes will increase and construction vehicles will be more visible along the portion of the R357 near the site. This will result in a temporary slight adverse impact on local residents and road users. During the operation phase, the traffic volumes will be slightly higher than that which pertains at present, but will result in a barely perceptible change to the perceived character of this portion of the R357.

17.4.2 Landscape and Hydrology

The Silver River is the main hydrological feature of the immediate site context, but this river is not visually significant landscape feature. There are no known negative interactive impacts between hydrology and landscape, once the specified hydrological mitigation measures are implemented.

17.4.3 Landscape and Soils & Geology

The proposed development does not require significant excavation and the proposed earthworks will not significantly alter the existing landform of the site. Therefore, there is no negative interaction between the soil and geological aspects of site and landscape and visual concerns.

17.4.4 Flora and Fauna

The removal of some of the existing vegetation from parts of the western and northern site boundaries, will reduce the level of screening into the site and also temporarily impact on the volume of vegetation providing potential wildlife habitat. However, the proposed mitigation

planting will increase the variety of native tree and shrub species on site and this will have a positive impact of providing increasing screening and increased ecological benefit. The management of the site vegetation will also result in a positive impact to the appearance and condition of site vegetation.

17.4.5 Landscape and Human Beings

In relation to the potential interaction between landscape and visual impacts and impacts to human beings, the general public will be predominately concerned by the visual impact of the development and any resulting alteration to the landscape character of Lumcloon area, the Lough Boora Parklands complex and the wider Bog of Allen landscape.

The visual assessment concentrates on the potential impact of the development to the human '*visual receptors*', predominantly the local residents and road users. The potential tourist and recreational users of the site context are also considered in the assessment, through the analysis of key visual reference points (such as the nearby Boora Parklands Complex, the R357 - Designated Scenic Amenity Route and the Offaly Way – a waymarked way).

The landscape character of the application site will experience a substantial effect during the initial construction period. During this phase, the construction machinery and vehicles will be partially visible from the immediate site context. During the operation phase of the development, the impact of the development will reduce to a slight adverse effect on landscape character, into the medium and longer term. The development will be largely obscured from viewpoints along the Offaly way and within Lough Boora Parklands and following it will not impact negatively on the tourist's overall impression of the Bog of Allen landscape.

The current site conditions may be perceived as derelict and '*damaged landscape*' by the general public. The development will alter the character of the site from rural brownfield to industrial, however the site had an industrial character in the recent past due to the former ESB plant. The proposed landscape mitigation measures will act to screen and assist integration of the development into the site and improve the appearance of the site.

17.5 FLORA AND FAUNA

17.5.1 Flora and Fauna and Hydrology

Hydrology is directly interrelated to the health and status of all aquatic based ecological systems. The main freshwater habitats onsite are the drainage channel and Silver River. All

discharges and potential spillages, which have the potential to negatively impact on the hydrology of the site, also therefore have the potential to negatively impact on the flora and fauna, which depends on the hydrological system for survival. With these potential impacts in mind, the proposed development has incorporated best practice into the development including a SUDS system, process, foul and surface effluent treatment to ensure that water quality of the river system is sustained and the status of aquatic flora and fauna is maintained.

17.5.2 Flora and Fauna and Hydrogeology

In a similar manner hydrogeology is responsible for creating and maintaining the biotic conditions on which ecological systems depend. The abstraction of groundwater as part of the during the operation of the facility has the potential to negatively impact upon the Silver River's ecology and hydrology. A hydrogeological study (see Chapter 8) demonstrated that the proposed abstraction would have no direct negative impacts on the water levels within the Silver River and consequently this activity will not negatively impact on flora and fauna which depend upon the stability of water levels within the river system.

17.6 HYDROLOGY

17.6.1 Hydrology and Flora and Fauna

Hydrology plays a critical role in the status of aquatic ecosystems. Good water quality is essential for a robust, vibrant and diverse aquatic ecological community. For the proposed development, the likely significant impact between hydrology and ecology is associated with the proposed effluent and stormwater discharges and accidental spillages. The proposed development will employ recommended mitigation measures during the construction and operation phases of the development to ensure that water quality is sustained. These measures are outlined in Chapter 9, Hydrology.

17.6.2 Hydrology and Groundwater

Hydrogeology and hydrology have an intricate and complex relationship based on the interaction between groundwater and surface water and the factors which influences both media on an individual and combined basis. The proposed groundwater abstraction was raised as a concern during the consultation process. The baseline assessments determined that the proposed abstraction would have no direct negative impacts on the flow regime of the Silver River.

17.7 GROUNDWATER

17.7.1 Groundwater and Human Beings

There is an interaction between human beings and groundwater where the potential for pollution of groundwater supplies could impact on human health. No significant soil or groundwater contamination was identified at the site and residual contamination associated with historical activities was determined to be low level and localised. The impact on groundwater quality in the area due to any disturbance of contaminated soils was assessed to be negligible adverse and localised in nature. Any domestic wells identified are located upgradient of the proposed development and any potential groundwater contamination during construction will therefore not migrate towards these wells. It is not anticipated that there will be any impact on human health related to groundwater quality in the area.

17.7.2 Groundwater and Soils & Geology

There is a strong interaction between groundwater and soils and geology. Residual contamination associated with historical activities was determined to be low level and localised. The disturbance of contaminated soil during construction has the potential to impact on groundwater quality. However where necessary, excavated soils determined to be contaminated will be removed and disposed at a licensed facility.

17.7.3 Groundwater and Hydrology

There is an interaction between groundwater and surface water. The surface waters within the site are the Silver River to the east and drain bordering to site to the north. It is anticipated that there will be no contamination of surface water surrounding the site from either surface runoff from the site or leaching of contaminants to groundwater which ultimately discharges to the surface water features in the area. Chemical contamination of the groundwater was assessed to be sufficiently low level so as not to pose a threat to surface water features. It has been shown that the proposed abstraction of groundwater for process use will result in a negligible impact on the Silver River.

17.7.4 Groundwater and Flora & Fauna

There is an interaction between groundwater and flora and fauna in the form of groundwater dependent ecosystems (GWDEs). There are several Natural Heritage Areas (NHAs) and Special Areas of Conservation (SACs) in the region of the proposed development which are

groundwater dependent ecosystems. These are discussed in Chapter 10, Flora and Fauna, and comprise Lough Boora (NHA) (c. 2.5km to the southeast), Lough Coura (NHA) (c. 7km to the south west), Ferbane Bog (NHA & SAC) (c. 6km to the northwest) and Moyclare Bog (NHA & SAC) (c. 7km to the northwest). It is not anticipated that there will be any impact on the groundwater quality or quantity that would affect these sites. The distance of the sites from the proposed groundwater abstraction is such that there will be no impact on groundwater levels in the area of the sites.

17.7.5 Groundwater and Material Assets

There is an interaction between groundwater and material assets in the form of groundwater supplies. There is a number of private groundwater supplies within a 1km radius of the proposed development site which are used for domestic and agricultural purposes. There are also several public groundwater supplies at distances of between 7km to 15km of the site. It is not anticipated that there will be any impact on the groundwater quality or quantity that would affect these supplies.

17.8 SOILS AND GEOLOGY

17.8.1 Soils and Geology and Groundwater

There is a strong interaction between soils and geology and groundwater. The disturbance of contaminated soil during construction has the potential to impact on groundwater quality. It is not anticipated that there will be any impact on groundwater from areas on the site identified as having low-level metal, phenol and hydrocarbon contamination. The contamination assessment undertaken as part of the exit audit on behalf of ESB determined that any residual contamination present does not pose a threat to groundwater quality and the site was considered suitable for redevelopment. The underlying clay subsoils will also prevent migration of any contaminants to groundwater.

A pump test was completed as part of the assessment on the groundwater well present on the proposed site. A groundwater water sample was collected from the well at the end of the pumping test and analysed for a range of water quality indicators. These results did not indicate any significant contamination of groundwater at the site as a result of historical operations.

17.8.2 Soils and Geology and Hydrology

There is an interaction between soils and geology and hydrology (surface water). It is anticipated that there will be no contamination of surface water surrounding the site (Silver River to the east and drain bordering to site to the north) from either surface runoff from the site or leaching of contaminants to groundwater in hydraulic continuity with surface water. The contamination assessment undertaken as part of the exit audit on behalf of ESB determined that any residual contamination present does not pose a threat to surface water and the site was considered suitable for redevelopment. Clay subsoils underlying the site will also retard any migration of contaminants off site.

Construction activities which disturb or expose the soil have the potential to elevate suspended solids in runoff from the site which could impact on surface water bodies such as the Silver River. Mitigation measures during the construction process will prevent sediment run-off to the Silver River.

17.8.3 Soils and Geology and Human Beings

There is an interaction between human beings and soils and geology. The contamination assessment undertaken as part of the exit audit on behalf of ESB determined that any residual contamination present does not pose a threat to human health and the site was considered suitable for redevelopment. The site was confirmed to be asbestos safe. The low level metal, phenol and hydrocarbon contamination was determined not to pose a risk to human health.

17.8.4 Soils and Geology and Material Assets

There is an interaction between land use and soils and geology. The contamination assessment undertaken as part of the exit audit on behalf of ESB determined that any residual contamination present does not pose a risk for redevelopment of the site for industrial use.

17.9 MATERIAL ASSETS

The main interactions that material assets will have with other environmental topics include groundwater, air, roads and traffic and soils and geology. These interactions may result due to the proposed development's requirements for an on site water supply, generating dust emissions during construction, generating air emissions during operation, increasing traffic to and from the facility during construction and operation and as a result of installation of site

utilities. The development would have the potential of a negative impact as outlined in Sections 7 (Soils and Geology) Sections 8 (Groundwater), Section 9 (Hydrology), 11 (Air), 14 (Roads and Traffic) however appropriate mitigation measures have been proposed which will ensure that potential impacts are avoided or reduced to low levels.

17.10 ROADS AND TRAFFIC

17.10.1 Roads and Traffic and Human Beings

The Construction phase of the development will have the largest impact on traffic flows; however it will be of a short term nature. It is anticipated that construction will be undertaken over a 32 month period beginning in 2010. Approximately 400 construction jobs will be created by the development and it is anticipated that this will generate approximately 400 car trips to and from the site per day, assuming a vehicle occupancy of two. It is anticipated that 30 HGV trips will be generated during peak construction works (civil and structural phase) as a result of delivery of materials to and from the site. The operational phase impacts are much smaller as during operation approximately 45 people will be employed. Both scenarios result in total traffic volumes much less than the capacity of the existing R357. Analysis was carried out on the proposed development junction with the development in place and it was found to have adequate reserve capacity when tested for the critical cases of the morning and evening peaks during construction, in the opening year and in the Design Year. This existing R357/R437 staggered junction when tested without the development was found to be operating efficiently. The junction has spare capacity for the natural growth of traffic as well as the development generated traffic for all scenarios. The existing local road T-Junction with the R357 is shown to have more than adequate spare capacity in the design year with all developments in place. Recommended mitigation measures to prevent any potential adverse negative impacts are outlined in Chapter, 14, Roads and Traffic. Therefore it was determined that the impacts to human beings as a result of traffic are not significant when compared with current levels.

17.10.2 Roads and Traffic and Air

As described in Chapter 11, Air, there will be negligible impacts to local air quality as a result of traffic generated during the construction and operation phases of the proposed development.

17.10.3 Roads and Traffic and Noise

The existing noise environment in the vicinity of the proposed site was observed to be typical to that of a rural area. The predominant noise sources noted were road traffic along the R357 and R437. During construction, there will be approximately 30 HGV movements per day. Construction site employee traffic volumes will result in approximately 400 vehicle movements per day assuming a vehicle occupancy of two. Existing AM and PM peak hour flows on the R357 are in the order of approximately 200 to 220 vehicle movements per day. Therefore, as a doubling of road traffic volume results in an approximate 3dB increase in noise level at adjacent properties, the noise impact from traffic during the construction phase will be negligible. Site traffic during the operation phases due to employees entering and leaving the site will give rise to a less than 20% increase in traffic flows and therefore operational site traffic will also result in an insignificant traffic noise impact in the vicinity of the proposed development site.