Environmental Impact Statement
for proposed
Intel FAB 24C Project,
Collinstown Industrial Park,
Leixlip, Co Kildare.

prepared for

Intel Ireland

by

Environmental Impact Services
Second Floor
The Courtyard
25 Great Strand Street
Dublin 1

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Table of Contents

List of Figures

List of Tables

List of Appendices

Appendix to Chapter 14. Architectural Heritage

1 INTRODUCTION AND PREAMBLE

1.1 INTRODUCTION AND TERMS OF REFERENCE

Environmental Impact Services has been commissioned by Intel Ireland to carry out an Environmental Impact Assessment (EIA) and prepare an Environmental Impact Statement (EIS) for the conversion of the semiconductor manufacturing plant known as FAB 24. The plant is located on Intel's campus at Collinstown industrial park, Leixlip, Co. Kildare.

The project entails making provisions for additional air treatment equipment (including stacks and Air Handling Units) as well as increased chemical and gas requirements. These are necessary to support upgrades and changes to the manufacturing toolset which are required maintain the ability of this plant to be positioned to attract the latest Intel manufacturing technologies.

It is important to note that mechanical manufacturing techniques will be un-changed, and the underlying processes and associated use of types of materials will generally not be different– to those which have been notified to the EPA for the Integrated Pollution Prevention and Control license.

Details of the proposed development are contained in Chapter 3.

1.1.1 OBJECTIVE OF THIS EIS ACCOMPANYING THE PLANNING APPLICATION

The objective of this EIS is to determine any significant impacts of the FAB 24C project on the environment and, where applicable, propose measures to avoid, reduce or remedy them.

The full project description and details are outlined in Chapter 3 Project Description of this document and also are fully described in the Planning Report which accompanies this application. In summary, the key elements of the FAB 24C project include:

- additional 29 roof mounted stacks and related items of plant and equipment;
- 3 storey air treatment building extension located to the rear of FAB 24 with associated roof mounted stacks;
- an extension (50m^2) to and conversion of the existing single storey silane store to a gas and chemical storage including a link structure and modifications to the dock area including a new canopy;
- a new Hydrogen Tank and an extension to an existing electrical switchroom;
- a new Air Handling Unit on the roof of IR6 Office Building;
- 3 new water storage tanks as previously permitted (Kildare County Council planning reg. ref 05/296)
- New aqueous room and solvent expansion area as previously permitted (planning reg. ref. 07/482)
- consists of a new external free standing structure with dedicated exhaust systems in the FAB 14/24 yard area
- additional external items of plant and equipment including minor modifications to existing elevations, utilities and yard areas.

All of these elements are described in detail in Chapter 3 Project Description.

1.2 LEGISLATION

Environmental Impact Assessments (EIAs) are carried out in response to the requirements of the European Community Council Directives on the assessment of the effects of certain public and private projects on the environment. The enabling statutory instruments (S.I.'s) which transpose these Directives into law in Ireland are the European Communities (Environmental Impact Assessment) Regulations, 1989, as updated by the Planning and Development Acts 2000 to 2006 (the EIA Regulations), with the main legislation being S.I. 600/01. These Regulations outline the classes of projects subject to Environmental Impact Assessment and the statutory format and content for an EIS.

The proposed development (which is for the purposes of the activity of the manufacture of integrated circuits and circuit boards) does not fall within any of the classes of development types specified in Part 10 of the Planning and Development Regulations 2001 (as amended). However the proposal is considered under Schedule 7 of the Planning and Development Regulations.

When the proposal is considered under Schedule 7 *'Criteria for Determining whether a development would or would not be likely to have significant effects on the Environment'*, as transposed in Irish legislation, which are grouped under three headings viz. (i) Characteristics of Proposed Development, (ii) Location of Proposed Development, and (iii) Characteristics of Potential Impacts, it is considered that the project should be accompanied with an Environmental Impact Statement having regard to the nature and scale of the proposal. Specifically the EIS addresses the increase in air emissions in particular Ammonia and VOC emissions.

This EIS has been prepared in accordance with Schedule 6 of the Planning and Development Regulations 2001 (as amended) and conforms to the relevant requirements as specified therein. The EIS has also been undertaken having regard to the Environmental Protection Agency (EPA) Guidelines on information to be contained in Environmental Impact Statements (EPA 2002) and Advice Notes on Current Practice in preparation of Environmental Impact Statements (EPA 2003) and the European Commission document "Guidance on EIA, EIS Review" (2001).

Stage 1 Screening and Stage 2 Appropriate Assessment have also been carried out to assess the potential to affect the integrity of the Natura 2000 network, if unmitigated. The appropriate assessment is provided as a separately bound document.

1.3 EIS FORMAT

This EIS follows a grouped format structure. Using this structure the EIS is prepared in a framework which examines each environmental topic (as prescribed by the Regulations) in a separate chapter. Each of these chapters refers to: -

- The proposed development
- The receiving environment
- Likely significant impacts
- Mitigation measures
- Residual impacts (where applicable)

Within the individual chapters, the EIS addresses each of the topics specified by the EIA Regulations as follows:-

EIA Regulation Topics	EIS Chapter Topics
Alternatives Considered	See Chapter 2
Project Description	Project Description
Human Beings	Human Beings
Flora	Flora & Fauna
Fauna	Flora & Fauna
Soils	Soils & Water
Water	Soils & Water
Air	Air Quality / Noise and Vibration
Climate	Climate and Microclimate
Landscape	Landscape & Visual Impact
Material Assets	Material Assets (Utilities) Traffic and Transportation
Cultural Heritage	Architectural Cultural Heritage Archaeological Cultural Heritage
Interrelationship Between the Above Factors	Addressed as it arises within the above chapters and addressed in 'Interactions of the foregoing'

Table 1.1 EIA Regulations Topics as addressed by the EIS

1.4 A NOTE ON QUOTATIONS

Environmental Impact Statements by their nature contain statements about the proposed development, some of which are positive, and some less than positive. Selective quotation or quotations out of context can give a very misleading impression of the findings of the study. Therefore, the study team urge that quotations should, where reasonably possible, be taken from the conclusions of specialists' sections or from the non-technical summary and not selectively.

The EIA Regulations require that difficulties such as technical deficiencies, lack of information or knowledge encountered in compiling any specified information for the EIS be described. There were no such difficulties encountered in the production of this EIS.

2. SCREENING AND SCOPING

2.1 LEGISLATION

Environmental Impact Assessments (EIAs) are carried out in response to the requirements of the European Community Council Directives on the assessment of the effects of certain public and private projects on the environment. The enabling statutory instruments (S.I.s) which transpose these Directives into law in Ireland are the European Communities (Environmental Impact Assessment) Regulations, 1989, as updated by the Planning and Development Acts 2000 to 2006 (the EIA Regulations), with the main legislation being S.I. 600/01. These Regulations outline the classes of projects subject to Environmental Impact Assessment (EIA) and the statutory format and content for an EIS.

2.2 SCREENING

The proposed development (which is for the purposes of the activity of the manufacture of integrated circuits and circuit boards) does not fall within any of the classes of development types specified in Part 10 of the Planning and Development Regulations 2001 (as amended).

When the proposal is considered under Schedule 7 *'Criteria for Determining whether a development would or would not be likely to have significant effects on the Environment'*, as transposed in Irish legislation, which are grouped under three headings viz. (i) Characteristics of Proposed Development, (ii) Location of Proposed Development, and (iii) Characteristics of Potential Impacts, it is considered that the project should be accompanied with an Environmental Impact Statement having regard to the nature and scale of the proposal.

Having regard to of Part 2(13) of Schedule 5 of the Planning and Development Regulations which states:

> Any change or extension of development which would:-
> (i) result in the development being of a class listed in Part 1 or paragraphs 1 to 12 of Part 2 of this Schedule, and
> (ii) result in an increase in size greater than –
> - 25 per cent, or
> - an amount equal to 50 per cent of the appropriate threshold, whichever is the greater.

As the increase of some of the emissions to air will be in excess of 25%[1] and in the interest of prudence it is considered that the project should be accompanied by an Environmental Impact Statement.

2.3 BASIS OF SCOPING FOR THIS EIS

The purpose of this EIS is to report the findings of the EIA process and therefore to inform the Planning Authority (Kildare County Council), statutory consultees, the public and interested parties about the likely effects of the project on the environment.

The information to be contained in an EIS is set out in the Regulations. The content of this EIS conforms to the relevant requirements. This EIS has also been prepared having regard to the Environmental Protection Agency's 'Guidelines on the information to be contained in Environmental Impact Statements' (EPA 2002).

[1] Specific details are included in the Air Quality and Climate Chapter of the EIS, where the effects of the increases, which will be within IPPCL limits, are fully assessed.

Scoping is the process of identifying potential concerns that need to be examined in detail in an EIS. The determination of potential concerns to be addressed in this EIS was largely based on:

- The requirements of the EIA Regulations;
- Consultation with statutory bodies (See 1.4 below);
- Environmental Protection Agency's 'Guidelines on the information to be contained in Environmental Impact Statements' (EPA 2002); and
- Experience of previous EISs.
- Environmental Considerations and BAT [See Appendix 2.1]

2.4 CONSULTATION WITH AGENCIES

The following bodies were consulted in the preparation of this report:

- Kildare County Council, including the following departments:
  - Planning
  - Environment
  - Water Services
  - Heritage
  - Roads and Transportation
  - Fire Services

- The Environmental Protection Agency
- The National Parks and Wildlife Service (Department of Arts, Heritage and the Gaeltacht)
- Inland Fisheries Ireland (IFI)
- The Health Service Executive (HSE)

The scoping was carried out through circulation of a draft scoping document for comment and a series of meetings including a large formal meeting convened by Kildare County Council for the specific purpose of scoping the EIS with most of the above bodies in attendance. A number of smaller meetings with representatives of specific Council departments and the other bodies were held at various stages during the EIA process.

All of the comments, suggestions and information provided were taken into account in the preparation of this EIS.

The scope of the EIS continued to be developed throughout the process. The final EIS covers all of the topics discussed during the consultation process, plus additional items that were added in response to issues that emerged during the detailed work involved in the EIA process.

The scope was reviewed in light of the European Court of Justice ruling of 3 March 2011[2] so that topics normally covered in an Integrated Pollution Prevention Control Licence (IPPCL) are also addressed in this EIS. This is to ensure that the Environmental Protection Agency, which is the decision making authority for IPPCLs, is adequately informed in it's considerations as a statutory consultee in the planning process. This has resulted in coverage of items such as: management of the installation; detailed description of air and noise emissions including precise locations; control and monitoring systems; resource use & energy efficiency; materials handling; best available technology; accident prevention and emergency response; remediation, decommissioning, restoration and aftercare; and statutory requirements. These items have generally been covered within the prescribed EIS Regulation topics. Specific appendices have been added where required. Appendix 2.5 shows where each of the IPPC Licence application topics have been addressed in this EIS.

[2] Case C-50/09

2.5 STUDY TEAM

The study team commissioned to prepare this EIS is listed below:

Role	Personnel	Company
Study Director	Conor Skehan	Environmental Impact Services
Study Manager	Paul Fingleton	Environmental Impact Services
Study Manager	Ciara Kellett	Environmental Impact Services
Specialist Topics		
Human Beings	Ciara Kellett	AOS Planning Ltd.
Flora and Fauna	Paul Scott	Scott Cawley
Soils, Geology & Hydrogeology	Dominica Baird	AWN Consulting
Water & Hydrology	Dr. Fergal Callaghan / Brian Tiernan (with input from Dr Tadg O'Flaherty)	AWN Consulting and Tadg O'Flaherty
Air Quality and Climate	Dr. Edward Porter	AWN Consulting
Noise and Vibration	Damian Kelly	AWN Consulting
Landscape & Visual Impact	Conor Skehan	Environmental Impact Services
Material Assets	Paul Fingleton (with inputs from AWN and Intel)	Environmental Impact Services
Waste Management	Dr. Fergal Callaghan / Elaine Neary	AWN Consulting
Roads, Traffic and Transportation	Brian Sloey / Stephen Davies	Jacobs Engineering
Architectural Heritage	Miriam Carroll and Annette Quinn	Tobar Archaeological Services
Archaeology	Annette Quinn	Tobar Archaeological Services
Major Accident Hazards	Dr. Fergal Callaghan / Brian Tiernan	AWN Consulting
Interactions & Cumulative Effects	Conor Skehan	EIServices

Table 2.1 Study Team Commissioned to prepare this EIS

3. PROJECT DESCRIPTION

3.1 INTRODUCTION TO THE PROJECT

A full development description is included in Section 4 of this document. In summary the proposed development consists of an additional 29 roof mounted stacks and related items of plant and equipment on FAB 24, in the yard between FAB 14 and FAB 24 and the new Air Treatment Building extension. The proposed Air Treatment Building extension is approximately 30 x 40m located to the rear of the FAB 24 building.

The development also includes an extension to, and conversion of, the existing single storey silane storage area to gas and chemical storage including a link structure and modifications to the dock area including a new canopy.

The development also includes a new Hydrogen Tank, three new water storage tanks (which were previously permitted – KCC Planning Reg. Ref. 05/296), a new Aqueous room and solvent expansion area (which was previously permitted – KCC Planning Reg. Ref. 07/482), an extension to an existing electrical switchroom, 9 Air Handling Units on the roof of FAB 24 and a new Air Handling Unit on the roof of the IR6 Office Building.

The development also consists of a new external free standing structure with dedicated exhaust systems in the FAB 14/24 yard area, and additional external items of plant and equipment including acoustic screening and minor modifications to existing elevations, utilities and yard areas.

It is important to note that mechanical manufacturing techniques will be un-changed, and the underlying processes and associated use of types of materials will generally not be different– to those which have been notified to the EPA for the Integrated Pollution Prevention and Control license.

As a result of the subject proposal this proposed development will ensure that the Irish plant will be positioned to attract the latest Intel manufacturing technologies.

3.2 NEED FOR THE PROPOSED DEVELOPMENT

The Intel manufacturing site in Ireland must remain positioned to introduce new technology and additional capacity at short notice driven by market demands. The proposed development is required to enable the Irish plant meet those future demands.

It is important to note that mechanical manufacturing techniques will be un-changed, and the underlying processes and associated use of types of materials will generally not be different– as those which have been notified to the EPA for the Integrated Pollution Prevention and Control license.

3.3 SITE LOCATION AND CONTEXT

Intel's lands at Collinstown are situated directly to the west of the town of Leixlip in Kildare. Leixlip is a settlement of ca. 15,000 inhabitants located approximately 15 km to the west of Dublin City Centre. It is readily accessible by road in the form of the M4 motorway and by rail via Iarnród Éireann commuter services and the Sligo-Dublin 'Arrow' service which stops at Leixlip Louisa Bridge directly to the east of the Intel facility. In addition, Dublin Bus, Bus Éireann and the private transportation sector operate a substantial range of services to Leixlip from Dublin City Centre.

The Intel Campus is situated on a ca. 146 hectare site to the west of Leixlip at the Collinstown Industrial Estate. The Intel Campus is one of the largest single manufacturing facilities in Ireland and currently employs in the region of 4,000 people.

The Intel Campus is bounded by the Sligo to Dublin Railway Line and the Royal Canal to the east and to the south, by the Blakestown / Kellystown Road to the west and by the River Rye Water to the north.

The southern side of the site is bounded by the by the R148 and R449 regional roads which lead to Leixlip/Maynooth and the M4 motorway respectively.

3.4 OUTLINE DESCRIPTION OF THE PROPOSED DEVELOPMENT

A map of the proposed development is provided in Figure 3.1 below (For more detailed maps please refer to the planning drawings submitted with this planning application)

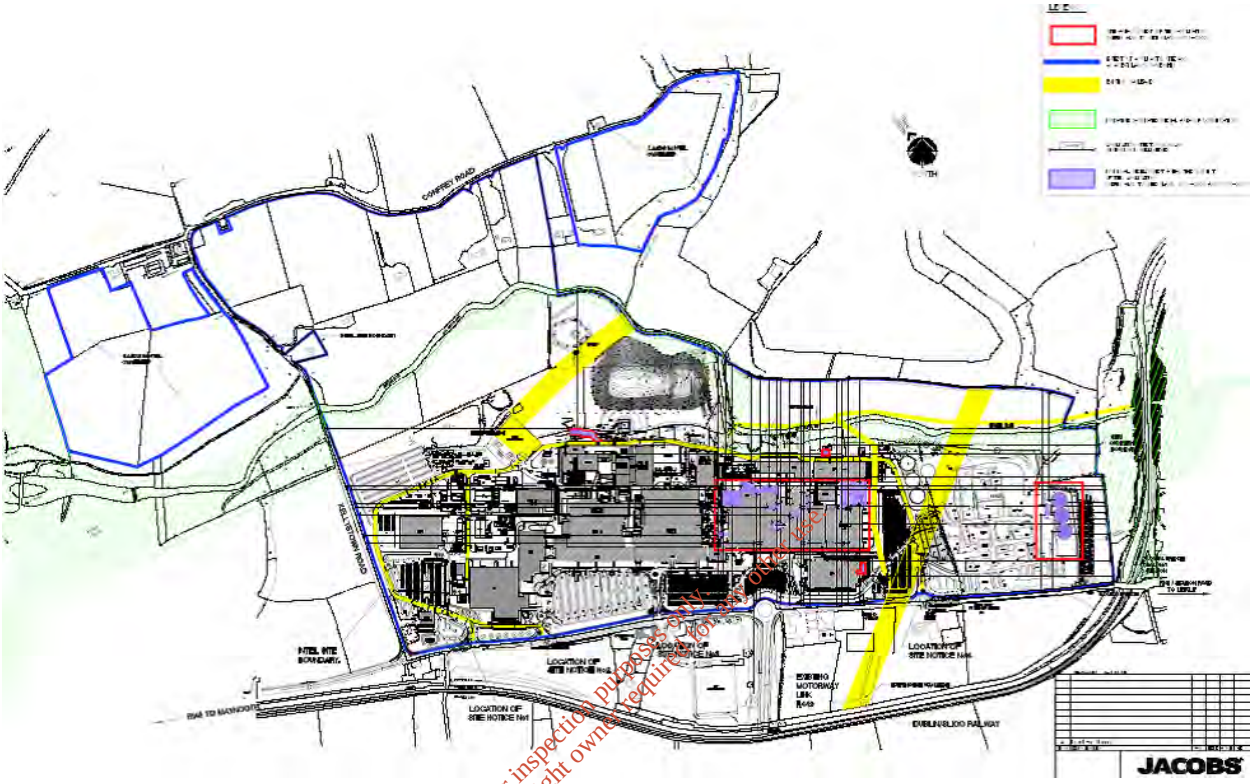


Figure 3.1 Map of the Proposed Development

The development as described in the public notices is as follows:

> The proposed development consists of:
> a) 29 no. roof mounted stacks (with a maximum height of 12metres, minimum 3metres) over the FAB 24 parapet and maximum height of 8metres over the higher existing air abatement parapet, and related items of plant and equipment; b)A 3 storey air treatment building extension to house abatement equipment (sized 30 x 40metre footprint with a gross floor area of 1980sq.m including access mezzanines) located to the rear of FAB 24. This building is 24m high; c) A new steel structure supporting stacks and related equipment (75sq.m)to the rear of the FAB 24; d) 9 no roof mounted air handling units and exhaust fans are also to be added to the FAB24 roof. e) A new external free standing structure (175sq.m)with dedicated exhaust systems in the FAB 14/24 yard area; f) A cladded roof mounted acoustic screen to the north west of FAB24;
> All of the above are principally necessitated by abatement technology alterations to the Fab 24 building.
> g)A minor extension (50sq.m) to and conversion of the existing single storey silane store to gas and chemical storage including a link structure and modifications to the dock area (70sq.m) including a new canopy. h)A new horizontal hydrogen tank (6metres high) and road access to the rear of FAB10, i) A single storey extension (85sq.m) to the existing FAB24 electrical switchroom, j) A new air handling unit located on the roof of the IR6 office building, k) Additional external items of plant and minor modifications to existing elevations, utilities and yard areas. l) A previously permitted single storey aqueous building expansion to the rear of FAB14 (sized 442sq.m) and the solvent bay expansion (sized 74sq.m) including loading dock (sized 93sq.m), (KCC Planning Reg Ref. No. 07/482); m)Three number water storage tanks and single storey pumphouse (sized 118sq.m) to the east of FAB 24, previously approved (KCC Planning Reg Ref. No. 05/296) and associated security fencing (2.4 metres high).

The FAB 24 manufacturing facility is amongst the most advanced semiconductor factories in Europe. Intel has made huge investments in Ireland. The ability of the Irish plant to survive and grow is based on the ability of the Irish plant to attract and retain the latest manufacturing technologies for the production of integrated circuits. Accordingly upgrades and changes to the toolset which manufacture the process drive a need for increased utility and facility capabilities. This increase in utility demand drives the need for additional air treatment equipment (including stacks and Air Handling Units) as well as increased chemical and gas requirements. Hence the subject development proposes to address this additional demand.

3.5 DETAILED DESCRIPTION OF THE PROPOSED DEVELOPMENT

The proposed development will entail the following elements:

a) 29 new roof mounted stacks
- The stacks are located at the following locations;- on the roof of the new Air Treatment Building (16 no.), FAB 24 (2 no.) Free standing structure between F14 and F24 (3 no.), north west of FAB 24 (4 no. including a new generator stack), north central of FAB 24 (4 no.). The stacks are on average 12m above the parapet of FAB 24 and 8m above the parapet of the existing Air Abatement parapet;

b) A new Air Treatment Building located north east of FAB 24-2. This building comprises steel three storey building;
- The air treatment facilities comprise complex ductwork, air cleaning equipment (including scrubbers, fans and filtration systems).

c) An additional 9 Air Handling and Exhaust units (Make up Air Handlers – MAH) on the roof of FAB 24;
- The additional ventilation systems are required as new toolsets in the manufacturing area require increasing amounts of ventilation;
- 3 of the MAH's are on the south side of the FAB 24 roof; 2 are along the central spine of existing MAH's and 4 are located to the north of the roof;
- All of the MAH's are approximately 20m x 6m x 5m high.

d) Extension (50m2) and conversion of the Silane pad to a gas and chemical store located to the north of FAB 24 as per Drawing 6111-D012 and Figure 4.2 below;
- The Silane pad currently houses only Silane (a pyrophoric gas stored in cylinders). This area is being extended and converted to a Solvent staging room;
- This modification includes a link to the manufacturing area as well as a canopy to cover the dock area;
- New loading dock levellers and a concrete ramp complete with guardrails are also included.

e) An Aqueous and Solvent Room expansion area;

f) An external free standing structure in the FAB 14/24 yard that will comprise 3 new exhaust fans and stacks and a structure to carry the ductwork horizontally across to the roof;

g) A new horizontal hydrogen tank to the north of the FAB 10 utility buildings which is to be located to the rear of the existing Hydrogen tank (referred to as HPH2 – High Purity Hydrogen);
- Modifications to the existing roadway are required to provide road access to the tank;
- The tank is surrounded by a 3m high fence and accessed via double sliding gates;
- The tank is considered within the Seveso report which accompanies this Application.

h) A single storey extension to the existing electrical switchroom;

i) A new Air Handling Unit on the roof of IR6 to the south of FAB 24;

j) A new steel structure to support 3 new fans and stacks to the west of the AWN Pit

k) Three new water storage tanks to the east of the site, these are approximately 16m in diameter, 7m high with a galvanised tank cover in the shape of a shallow cone extending the height at the central apex by 1.5m; and

l) A cladded roof mounted acoustic screen to the north west of FAB 24.

A full Seveso report as well as an EIS and an NIS accompany this Application which clearly demonstrates that the proposed development is fully compliant with all necessary legislation.

Hours of operation during construction and operational phases are given in Table 13.1.

3.6 STRUCTURE, MATERIALS AND FINISHES

Structure
Structure shall consist of steel braced structures to Engineers design.
Framing for other structures will be steel beams and columns designed by the structural engineer. Lateral stability will be achieved with concrete shear walls and/or steel braced frames.
The slab on grade shall be reinforced concrete slab.

Walls
The walls of the FAB building revisions and air treatment building and acoustic screens shall be similar to the existing facility in finish and detail:

The front elevation shall be constructed of 6,000 L x 1,000 H by 50mm thick patent, coloured “Tedlar” coated composite ribbed and insulated panel system (Beige 770 15) and the rear shall be dark brown (like the existing buildings) at the production and service areas. Panels shall be complete with all necessary matching specials, accessories, and trims, and all fixed at 3,000mm centres on mild steel (MS) stanchions and intermediate MS posts. All external items, where possible, will be painted dark brown to match the existing cladding.

Windows
Windows shall be double glazed using dark brown tinted solar control glass with set in matching aluminium sections and designed, fabricated and installed by specialist sub-contractor. Units will be designed to comply with the insulation values required by the building regulations. Glass will match existing installation on site.

Vibration and Noise Control and Abatement
Fan noise and vibration will be abated by means of plenum liners and vibration isolators. Mechanical equipment noise will be minimised by means internal attenuators and duct liners. Ductwork velocity noise will be reduced by sizing of ductwork to minimise velocities and eliminate noise regeneration. Mechanical equipment noise transmissions will be reduced by use of acoustical louvers instead of weather louvres; use of solid doors instead of louvered doors; structure borne sound will be minimised by use of vibration isolation pads, flexible connections and spring mounted pipe supports.

4. HUMAN BEINGS

4.1 INTRODUCTION

This chapter considers the impact of the proposed development in the context of population and settlement, land use, employment and other impacts of a social and economic nature. It will determine any significant impacts of the proposed development on this aspect of the receiving environment and, where applicable, propose measures to avoid, reduce or remedy these.

In terms of human beings, the types of issues which developments such as this raise (both during construction and operation) include: nuisance and disturbance during construction; increased traffic; additional economic opportunities; and impacts on existing land uses. (Issues such as noise, air quality, landscape and traffic are addressed in subsequent specialists sections and this Human Beings section includes cross references to those as relevant.)

4.1.1 METHODOLOGY

The methodology for this section involves examination and compilation of all relevant population and socio-economic data collected by the Central Statistics Office (CSO) and any other relevant bodies. It also has regard to all relevant planning and land-use documents for the area including the Kildare County Development Plan (2011-2017) and the Leixlip Local Area Plan (2010-2016).

After presenting an analysis of all relevant baseline information relating to the existing socio-economic situation in the area, this section provides an assessment of the potential impacts of the proposed development before setting out what mitigation measures are required to lessen such impacts.

4.2 SITE AND DEVELOPMENT CONTEXT

This section provides a brief overview of the existing environment in and around the site of the proposed development as it relates to human beings, starting with details of the site's overall development context before describing the key socio-economic characteristics of the area.

The proposed development will consist of upgrades to the existing FAB 24 wafer fabrication facility on the Intel Ireland Campus at Collinstown Industrial Park, Leixlip, Co. Kildare. A detailed description of the proposed development is provided in Chapter 3 of this EIS as well as in Section 4 of the Planning Report that accompanies this application.

It is estimated that the upgrades will not result in the employment of significant *additional* personnel when complete but will ensure that the campus is well placed to develop future technology for the Intel Corporation. During the construction phase of the project it is estimated that employment on site will peak at 800 – 1,000 and will fall gradually as the project nears completion.

The site of the proposed development forms part of the larger Intel Ireland Campus which is located on the Collinstown Industrial Park in Leixlip, Co. Kildare approximately 15 km west of Dublin City. Nearby towns and villages include Maynooth, ca. 5 km to the west, Dunboyne, Co. Meath ca, 5.5 km to the north, Lucan, Co. Fingal ca. 5 km to the southeast and Celbridge, Co. Kildare ca. 4.5 km to the south.

In terms of transportation infrastructure, the Intel Ireland Campus is readily accessible by road in the form of the M4 motorway and by rail via Leixlip Louisa Bridge train station which is located directly to the east of Collinstown Industrial Park. In addition, Dublin Bus, Bus Éireann and the private transportation sector operate a substantial range of services from Leixlip to Dublin City Centre.

4.3 LAND USE

While the overall size of the Intel Ireland Campus is ca. 145 hectares, the footprint of the proposed development represents a small portion of this as the works mainly consist of changes to existing buildings and the addition of stacks and air handling equipment on the roof of the FAB 24 building. The

predominant land use for the overall site is for the industrial fabrication of silicon wafers which are used in the production of computer processing chips. This use was first established with the construction of the first 'Electronics Systems Manufacturing and Assembly Industry' building (IR1[1]) at Collinstown Industrial Park in 1990.

Primary land uses surrounding the Campus include: largely undeveloped rural / agricultural land uses to the north, west and southwest; low intensity recreational uses associated with the Leixlip Recreation Centre and Leixlip United Football Club to the southeast as well as low to medium density residential uses to the south and east in the direction of Leixlip Village.

These land uses are reflected in the zoning categories for the area set out in the Kildare County Development Plan (CDP) as well as the Leixlip and Collinstown Local Area Plans (LAPs), all of which place considerable emphasis on the continuing development of Intel manufacturing activity at Collinstown Industrial Park. (Detailed information on the planning and development context of the Intel Ireland Campus is provided in the Planning Report which accompanies this application).

Intel is classified as a 'lower tier' establishment under the European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations, 2006, S.I. 74 of 2006 (Seveso II or COMAH Regulations). A separate Control of Major Accidents Hazards Report is has been submitted as a separate document accompanying the planning application for the proposed development. This report assesses the major accident hazard potential of FAB 24C in the context of the campus.

4.4 SOCIO-ECONOMIC CONTEXT

As has been discussed previously, the site of the proposed development forms part of a larger industrial park located ca. 2 km to the west of Leixlip Village and within 5.5 km of a number of other settlements including Maynooth, Lucan and Celbridge. This area can be regarded as the immediate hinterland in terms of socio-economic impacts arising from the new development.

The secondary hinterland can be regarded as the Greater Dublin Region as direct and indirect employment, purchasing, employees' residences etc. are likely to be located throughout the Dublin Region and beyond. The following socio-economic analysis concentrates mainly on the immediate hinterland[2] in terms of population and employment as this is the area where most impacts will arise.

4.4.1 POPULATION

Despite a growth in emigration levels and lower levels of immigration, recently published preliminary results from the 2011 Census indicate that between 2006 and 2011, Ireland's population increased by 341,421 to 4,581,269. This compares to an overall increase of 322,645 during the previous intercensal period (2002-2006).

During the previous intercensal period (2002-2006), some of the strongest growth nationally occurred in the Greater Dublin Region which accounted for some 40% of the population of Ireland. Within this region, the most significant growth was experienced in the counties of Fingal (22%); Meath (21.4%); Kildare (13.5%) and Wicklow (10.2%).

Preliminary figures from the 2011 Census indicate that while the population of the region as a whole continued to grow since 2006, the pattern of growth altered somewhat with considerable increases in central areas (and in Dublin City in particular) but with reduced, yet nonetheless substantial growth in counties Kildare, Meath, and Wicklow (see Tables 4.1 and 4.2 below).

[1] Intel utilise a sequential code numbering system for their facilities.
[2] The immediate hinterland is considered to be approximate to the Electoral Division (ED) of Leixlip itself as well as the adjoining 6 EDs of Blakestown – Blanchardstown, Lucan North, Lucan St. Helen's, Donaghcumper, Celbridge and Maynooth.

Area	Population 2006	Population 2011 (Preliminary)	Increase	% Increase
Total State	4,239,848	4,581,269	341,421	8.1
Greater Dublin Area	1,662,536	1,801,040	138,504	8.3
Dublin (4 Local Authorities)	1,187,176	1,270,603	83,427	7.0
Meath	162,831	184,034	21,203	13.0
Wicklow	126,194	136,448	10,254	8.1
Kildare	186,335	209,955	23,620	12.7
Hinterland of Proposed Development	94,244	106,562	12,318	13.1

Table 4.1 Population for State, Regions, Counties, Hinterland of Proposed Development 2006, 2011
Source: CSO Census of Population 2011, Preliminary Results

Area	Population 2002	Population 2006	Increase	% Increase
Total State	3,917,203	4,239,848	322,645	8.2
Greater Dublin Area	1,535,446	1,662,536	127,090	8.3
Dublin (4 Local Authorities)	1,122,821	1,187,176	64,355	5.7
Meath	134,005	162,831	28,826	21.5
Wicklow	114,676	126,194	11,518	10.0
Kildare	163,944	186,335	22,391	13.7
Hinterland of Proposed Development	82,986	94,244	11,258	13.6

Table 4.2 Population for State, Regions, Counties, Hinterland of Proposed Development 2002, 2006
Source: CSO Census of Population 2002, 2006

With regard to population growth in immediate hinterland of the proposed development, Tables 4.1 and 4.2 indicate that the total population of seven EDs in the immediate hinterland of the proposed development grew by a total of 12,318 or 13.1% in the intercensal period 2006-2011 and by 11,258 or 13.6% between 2002 and 2006.

This level of growth can be seen to be above the levels of population growth experienced both nationally and regionally and is indicative of strong economic activity in the area. It should be noted however, that the population of Leixlip Electoral Division itself actually declined somewhat during this period, possibly due to the growth in more affordable housing options in other parts of the wider area.

4.4.2 AGE PROFILE

The age profile of the population is important in terms of the potential labour force, the demand for schools, amenities and other facilities and the future housing demand. Tables 4.3 and 4.4 show the age profiles for the state, region, relevant counties and the hinterland of the proposed development for the years in which this information is available (2006 and 2002).

Table 4.3 below indicates that the local area is characterised by a relatively young population with 17.3% of the population aged between 15 and 24 years and 37.3% aged between 25 and 44 years. This compares to a national average of 14.9% and 31.7% respectively. Some 22.9% of the population is aged less than 15 years, compared to the national average of 20.4%.

In 2006, the percentage of the Greater Dublin Area (GDA) population within the working age groups (15-64) amounted to 70.7%, compared to the State average of 68.5%. The comparable figure for the direct hinterland of the proposed development was 73.3%. Again, this is indicative of a relatively more youthful population.

Area	0-14 [%]	15-24 [%]	25-44 [%]	45-64 [%]	65+ [%]	Total Persons
Total State	20.4	14.9	31.7	21.9	11.0	4,239,848
Greater Dublin Area	19.6	15.6	34.4	20.7	9.7	1,662,536
Dublin (4 Local Authorities)	18.3	16.2	34.5	20.6	10.3	1,187,176
Meath	23.1	15.0	34.6	20.5	6.9	186,335
Wicklow	23.4	13.5	34.7	20.4	8.0	162,831
Kildare	21.5	14.1	32.0	22.5	9.9	126,194
Hinterland of Proposed Development	22.9	17.3	37.3	18.7	3.8	85,542

Table 4.3 Age Profile at State, Regions, Counties and Hinterland Level, 2006
Source: CSO Census of Population 2006

Table 4.4 indicates that the situation was much the same in 2002, when 70% of the Greater Dublin Area population was within the working age groups (15-64) compared to the State average of 67.7%. The comparable 2002 figure for the direct hinterland of 73.1% for the proposed development was very similar to 2006 levels. This could be seen to be indicative of the ongoing consolidation of the economic role of the area as a significant employment centre.

Area	0-14 [%]	15-24 [%]	25-44 [%]	45-64 [%]	65+ [%]	Total Persons
Total State	21.1	16.4	30.1	21.2	11.1	3,917,203
Greater Dublin Area	20.3	17.2	32.5	20.3	9.6	1,535,446
Dublin (4 Local Authorities)	19.2	17.7	32.7	20.2	10.2	1,122,821
Meath	23.6	15.4	31.7	20.5	8.7	134,005
Wicklow	22.5	15.4	30.3	21.9	10.0	114,676
Kildare	23.7	16.5	33.4	19.7	6.7	163,944
Hinterland of Proposed Development	23.4	18.8	36.8	17.6	3.5	75,229

Table 4.4 Age Profile at State, Regions, Counties and Hinterland Level, 2002
Source: CSO Census of Population 2002

4.4.3 ACCOMMODATION / HOUSING DEMAND

Table 4.5 below details the total number of private households at national, regional, county and local level in 2002 and 2006. This table indicates a large increase in private households in the area during the last decade in line with overall increases in counties in the Mid-East region, and considerably higher than the national average level of private household growth.

Area	Total Number of Private Households		Increase in Private Households 2002-2006	
	2002	2006	Number	%
Total State	1,287,958	1,469,521	181,563	14.1
Greater Dublin Area	508,096	578,194	70,098	13.8
Dublin (4 Local Authorities)	379,372	420,429	41,057	10.8
Meath	41,675	53,938	12,263	29.4
Wicklow	36,572	42,870	6,298	17.2
Kildare	50,477	60,957	10,480	20.8
Hinterland of Proposed Development	22,958	27,495	4,537	19.8

Table 4.5 Total Number and Increase in Private Households 2002 - 2006
Source: CSO Census of Population 2002, 2006

According to the recently adopted Kildare CDP, 2006 levels represented a peak in housing supply in the area. Since then housing completion levels have fallen considerably and between the end of 2006 and 2008 the house completion rate in the county dropped by 62%, reflecting a pattern evident throughout the country as a whole. As a result, the Plan anticipates that the level of output will remain low for the period 2011/2012 with an increase anticipated over the short-term.

With regard to strategic growth objectives for the settlements in the hinterland of the proposed development, the Kildare CDP (in accordance with Regional Planning Guidelines) has designated a minimum of 35% of the total population/unit growth rate allocation for Kildare to the four Metropolitan towns of Maynooth, Celbridge, Leixlip and Kilcock. This translates into an additional 9,385 housing units for 17,995 people in these areas which will increase their share of the total population in County Kildare from 25% in 2006 to 29% in 2017.

These figures are generally in line with the population capacity of undeveloped land in the immediate area of the proposed development as outlined in the LAPs for Leixlip and Collinstown. As Table 4.6 below demonstrates, considerable additional capacity exists for the provision of the additional accommodation in the immediate vicinity of the proposed development.

Plan	Year of Plan	Undeveloped land (ha.)	Population Capacity of Undeveloped Land	Potential Units Deliverable	Units granted but not built
Leixlip LAP	2010	49.7	6,532	2,094	608
Collinstown LAP	2010	39.9	4,340	1,634	0

Table 4.6 Development Capacity of Land Zoned in the Leixlip and Collinstown LAPs
Source: Kildare County Development Plan, 2011-2017

Figure 4.1 shows the distribution of Intel employee residents in 2002 and 2004. It can be seen that employees are widely dispersed through out the Dublin Metropolitan Region, County Meath, County Kildare and beyond. However, a significant percentage lives in the immediate hinterlands of the proposed development.

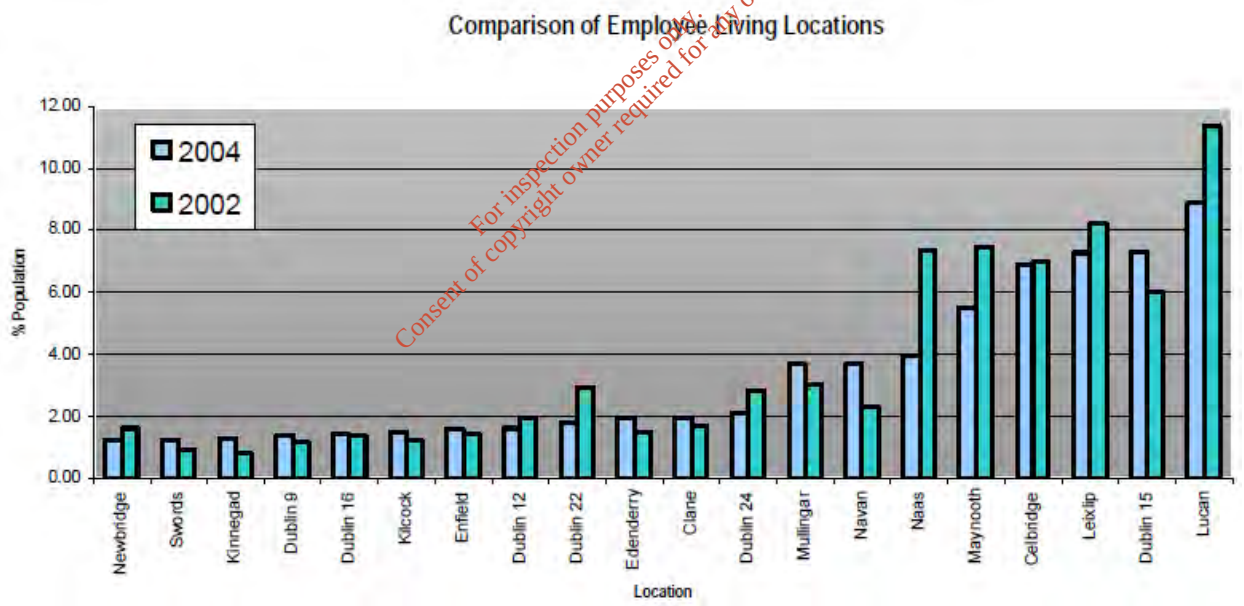


Figure 4.1 Intel Employee Living Locations 2002 and 2004
Source: Data Provided by Intel

Although the data presented in Figure 4.1 is now somewhat out of date, it is still applies as the overall distribution of living locations of Intel employees has not changed considerably since this research was conducted in 2005.

4.4.4 EMPLOYMENT

After a sustained period of virtually full employment, unemployment levels have increased sharply since July 2008. According to the Central Statistics Office, the seasonally adjusted standardised unemployment rate has risen from its lowest point of 4.4% in 2006, to 6.4% in 2008 to 13.6% in 2010. The latest CSO figures (at August 2011) indicate that the national rate of unemployment now stands at 14.4%.

In County Kildare there has been a significant increase in the numbers of people 'signing on' since the end of February 2007 and between December 2008 and December 2009 the number signing on the register at offices in the county increased from 11,571 to 17,229. According to the Kildare CDP, between the period December 2008 to December 2009 the highest proportionate increase on the live register in Kildare (61%) took place in the Maynooth Office.

As unemployment data collected as part of the 2011 census has yet to be published, a detailed analysis cannot as yet be made of the impact of the recent economic downturn on the hinterland of the proposed development. However, Table 4.7 indicates that prior to 2006 the overall economic makeup of the hinterland of the proposed development was largely similar to that seen at national, regional and county levels. This would suggest that the significant increases in unemployment in the State and in Kildare would have been mirrored in the areas surrounding the proposed development.

In the light of such significant increases in unemployment across the region, the presence of leading high technology industries such as Intel and Hewlett-Packard will have helped to buffer the Leixlip area from some of the worst economic impacts of the recession. According to Census data quoted in the Leixlip LAP, almost 6,000 workers travelled into Leixlip to work in 2006 resulting in a total working population of almost 7,000. The importance of such companies in Leixlip can not be overstated both with respect to their positive knock on effects on Leixlip itself but also on County Kildare as a whole.

Area	Agricult. forestry, fishing	Building and construct.	Manufacturing industries	Commerce and trade	Transport and comms.	Public admin.	Prof. services	Other
Total State	1.4	9.6	14.8	27.5	5.3	6.2	18.7	16.4
GDA	0.8	7.5	11.7	33.0	6.3	6.7	17.0	17.6
Dublin County	0.3	6.3	9.5	34.9	6.7	6.6	17.2	18.4
Meath	2.0	12.2	15.8	27.1	5.9	6.6	16.4	13.8
Wicklow	1.7	9.4	14.0	29.7	4.7	5.5	17.5	17.6
Kildare	1.9	10.1	15.8	27.7	4.9	7.8	16.3	15.6
Hinterland of Proposal	0.6	8.8	14.3	31.2	6.0	8.2	17.1	13.8

Table 4.7 People at Work by Sector in 2006
Source: CSO Census of Population 2006

Since locating to Leixlip in 1990 Intel has made a significant positive impact on the national and local economy and the company currently provides employment for ca 4,000 people. The F24C project, once operational, will not change the employment level of the campus. A peak of 800 – 1,000 construction jobs will be created during the construction phase.

Intel Ireland will utilise the skills and technical expertise available in Ireland. It is anticipated that construction staff will be employed locally and materials will be sourced from local providers, where possible. When operational, the project will help sustain significant employment at state level and help to sustain employment in the County and bring employment closer to where people reside.

4.4.5 TOURISM, AMENITY AND RECREATION

The Kildare County Development Plan 2011-2017 identifies Carton Estate to the west of the Intel Ireland Campus as a tourism facility of national and international significance. Another important recreational amenity in the area is the Royal Canal which runs to the south of the Intel Ireland Campus. The Canal traverses a scenic route between Leixlip and Maynooth crossing the Rye Water by an impressive aqueduct at Leixlip Spa and skirting Carton Demesne.

4.4.6 OTHER SOCIO ECONOMIC CHARACTERISTICS

According to the results of the 2006 Census, car ownership levels in the hinterland of the proposed development are considerably higher than national levels. However, as Table 4.8 below indicates, these car ownership rates are in line with those for County Kildare and the other counties which make up the commuter belt surrounding Dublin.

Area	% with 1 car	% with 2 cars	% with 3 + cars	Total % with car	Total % no car
Total State	38.6	32.9	8.7	80.3	19.7
GDA	38.7	31.1	7.5	77.2	22.8
Dublin County	39.8	27.4	6.2	73.5	26.5
Meath	34.5	43.7	11.5	89.8	10.2
Wicklow	36.8	37.2	10.7	84.7	15.3
Kildare	35.6	40.9	10.5	87.0	13.0
Hinterland of Proposal	39.1	39.7	9.2	88.0	12.0

Table 4.8 Percentage of Households with None, One, Two and Three Motor Cars
Source: CSO Census of Population 2006

Table 4.9 shows that in 2006, a large percentage (21.2%) of the working population in the hinterland of the proposed development travelled between 15 and 25 km to work, school or college, once again suggesting a strong pattern of commuting between the area and Dublin's Central Business District. (Note that the issue of travel and commuting is dealt with in more detail in Section 13 of this document).

Area	0-1 km	1-2 km	2-4 km	5-9 km	10-14 km	15-24 km	25-49 km	50+ km	Not Stated
Total State	1.0	10.8	19.5	15.8	10.3	10.4	7.9	3.9	20.5
GDA	0.8	10.4	19.2	16.9	11.3	10.4	7.2	2.6	21.3
Dublin County	0.7	10.7	20.7	19.2	12.3	9.1	3.7	0.8	22.8
Meath	1.0	8.9	13.9	11.2	8.8	13.1	17.4	8.9	16.8
Wicklow	1.0	10.5	15.6	10.4	8.4	14.4	13.9	6.3	19.5
Kildare	0.9	10.3	16.4	11.7	9.0	13.7	15.3	5.4	17.3
Hinterland of Proposal	0.6	11.2	16.0	12.3	12.8	21.2	8.3	1.5	16.2

Table 4.9 Distance Travelled to Work. School or College, 2006
Source: CSO Census of Population 2006

4.5 POTENTIAL IMPACTS

As was explained at the start of this chapter, the proposed development will consist of upgrades to the existing FAB 24 wafer fabrication facility on the Intel Ireland Campus at Collinstown Industrial Park, Leixlip, Co. Kildare. The following section will address how this proposed development could impact on the environment during the construction process itself as well as during the operation of the upgraded facility.

4.5.1 LAND USES

The proposed development will entail the upgrade of industrial production processes on a site that has been used for the production of electronic components and micro-chips since Intel came to Leixlip in the early 1990s. In addition, the whole Intel Ireland Campus, including the site of the proposed development is currently zoned '*Industrial and Warehousing*' the stated objective for which is '*to provide for office, warehousing and industrial Development*'.

During construction there will be some temporary disruption to the existing land use to facilitate works on-site but as this disruption will be short lived and is in character with existing uses, this will not represent a significant impact in terms of land uses in the area. No public rights of way will be severed, including existing Fishermen's' access rights along the Rye Water and no community facilities will be compromised.

The proposed development can be seen to fully comply with established uses on site, as well as with the statutory land use zoning and will not impact on surrounding land uses. A separate Control of Major Accidents Hazards Report is included as an Appendix to this Chapter (Appendix 4.1) and also in Appendix 2.2. . This assesses the major accident hazard potential of FAB 24C in the context of the campus. Further details of Environmental Considerations and Best Available Technology [BAT] are also described at Appendix 2.1.

Adverse impacts on local land uses are unlikely to occur during operation and any residual impacts are likely to be negligible.

4.5.2 POPULATION AND HUMAN HEALTH

During construction there may be some limited impacts on the residential amenity of the population living in the locality such as increased traffic.

This potential impact is quantified and described in detail in the Traffic and Transportation Chapter (Chapter 13) of this report. Any impact is likely to be temporary and will be addressed by appropriate management of traffic movements into and out of the site.

During operation, there should be no impacts on the locality due to traffic flows in the area as no additional traffic is anticipated.

It should be noted that the potential for effects on human health are dealt with in this EIS under the more specific topics of the environmental media by which they might be caused including air, water, noise and waste, as well as Appendix 2.1 Accident Prevention and Emergency Response.

In addition, some health and safety related topics are covered by separate and more specific legislation and so do not form part of an EIS – examples include worker health and safety, construction safety and the use and marketing of chemicals.

4.5.3 ACCOMMODATION / HOUSING DEMAND

In terms of the potential impacts of the proposed development on accommodation and housing demand in the area during construction, there may be a slight increase in the population linked to construction activity on site.

It is not anticipated that these increases will have any significant impact on housing demand either during construction or during operation of the upgraded facility.

4.5.4 EMPLOYMENT AND ECONOMIC ACTIVITY

The key characteristic of the development in terms of its potential socio-economic impact, relates to its significant capital value and the fact that a considerable number of jobs will be created during its construction.

During construction it is estimated that employment on-site will increase gradually and peak to approximately 800 – 1000 persons and then fall gradually again as the construction phase nears completion. The development will have a significant capital value- estimated at ca €615 million ($800 million).

The construction of the proposed development will provide a significant boost for the construction sector – in terms of employment generation and capital spend on materials and construction labour costs.

In addition to the on-site job opportunities created, a certain amount of off-site employment will be supported by the construction of the project. This includes jobs in management and a range of professional firms supplying financial, architectural, engineering, legal and a range of other professional services to the project.

During operation the extension will ensure the continuation of ca 4,000 jobs. The provision of this number of high end jobs will safeguard a major employment source in North Kildare and with a workforce which will in turn continue to support local service employment.

The workforce at Intel will continue to be drawn from a wide geographical area. This will continue employment, both direct employment at the facility itself and indirect employment created by the multiplier effect. As a result, when in full production, the upgraded facility is expected to ensure ongoing the expenditure on goods and services in the wider region and Ireland as a whole due to increased contracts servicing the Intel Facility.

4.5.5 Tourism, Amenity and Recreation

During construction the visual amenity of the area may be temporarily intruded upon as a result of the use of tall cranes and delivery of materials to and from site. However, these impacts will be temporary in nature and will not impact on recreational or tourist amenities in the area such as the Carton House Estate and the route of the Royal Canal.

Due to the location and well-screened nature of the Intel site, there will be no significant impacts on tourism, amenity and recreation in the area during the operation of the upgraded facility. This issue is dealt with in more detail in Chapter 10 of this EIS which addresses the potential visual impact of the proposed development.

4.5.6 Impacts on Other Socio-Economic Characteristics

It is not envisaged that the proposed development will have any potential impacts on other socio-economic characteristics of the area such as levels of car ownership or means of travel to work, school or college. It should be noted however that these issues are dealt with in more detail in the Traffic and Transportation Assessment in Chapter 13 of this EIS.

4.5.7 Indirect Impacts

The effects of this development, could give rise to changes and effects which will eventually add to the effects of other larger and smaller projects. There will be indirect, highly localised and temporary impacts on patterns of employment, earning and spending resulting from the construction phase of the development. In addition, there will be longer-term but again localised impacts arising from the continued operation of the facility as identified above. Overall however, it can be stated that these impacts will be minimal due to the nature of the proposed development.

4.6 MITIGATION MEASURES

The mitigation measures proposed in the following sections relate to the construction and operational period of the proposed development. Such measures relate only to the avoidance, reduction or remedy of impacts, which affect human beings.

4.6.1 Construction Measures

The passage of heavy works vehicles during the construction phase is a short-term effect; i.e. numbers of vehicles will mirror the peaks of the construction phase and will end once the project is operational. The appropriate management of construction traffic will mitigate against significant impacts, as set out in Traffic and Transportation Chapter (Chapter 13) of this EIS.

A Construction Management Strategy for the development will identify a variety of measures that will be incorporated to mitigate against nuisance including provisions in relation to security on the site.

Intel Ireland have made a commitment to programme construction traffic including both construction plant and material deliveries to avoid peak traffic flows associated with operational shift patterns.

4.6.2 Operational Measures

The mitigation measures proposed relate to traffic improvements. They are only addressed in this section where they interact with human beings such as improving employee mobility.

Employees on the campus adhere to a Mobility Management Plan, which is updated regularly. The most current review of the plan was produced in November 2004. The plan sets out to increase the use of sustainable mode of transport through car pooling, the use of public transport, cycling and walking.

Intel Ireland operates a shuttle bus service in conjunction with Hewlett Packard to transport employees between Hazelhatch and Louisa Bridge Railway Stations. The Shuttle bus servicing the two main train stations continues to be a success.

Intel employs a large percentage of shift workers with shifts beginning at 7am and 7pm. These times purposely occur on off peak traffic times to help alleviate local traffic congestion. Other start times include administration and engineering at 8am and contractors at various times throughout the day. By staggering the start and finish times for Intel workers, traffic congestion is minimised and thereby reducing any environmental impacts associated with queuing traffic. It is proposed to continue the present work patterns.

The 'Work Life Effectiveness' (WLE) program is a strategic response by Intel to the significant lifestyle changes requested in a modern workplace. WLE has had an effect on the movement of traffic on site during the working week. The effects of this program are visible on Monday, Tuesday and Friday, when some employees tend to work from home. Traffic numbers entering site in the mornings show significant reduction on these occasions, when measured against traffic numbers entering site on Wednesday and Thursday. This trend seems to be continuing as the site grows, having a positive reducing effect on vehicle numbers coming into site.

4.7 RESIDUAL IMPACTS

It is anticipated that the proposed extension will realise significant positive overall economic and social benefits for the local community and the surrounding areas. The proposed upgrade of existing manufacturing facilities at the campus will have a positive long term impact on the immediate hinterland and the Dublin Region by consolidating production and employment levels to ensure the economic and social benefits associated with the site will continue into the future.

Traffic impacts, which in the past have been of significant concern, have been minimised through the provision of new access roads and the continual improvement of the nearby national routes. In addition the commitment to the implementation and ongoing development of a Mobility Management Plan will minimise any such impacts.

During operation of the Intel facility, tourism, recreation and amenity should not be affected by the proposed extension. The majority of the Intel site is screened by a large embankment, minimising any visual impacts; this also acts as a sound barrier to noise impacts from the operating plant.

Intel has carefully integrated into the physical, economic and social fabric of the local community without any undue effects on the overall settlement pattern of the Town. The proposed extension will assist Intel in continuing its economic and social links with Leixlip, in a manner that is in accordance with the proper planning and development of the area.

5. FLORA AND FAUNA

5.1 INTRODUCTION

This ecological impact assessment provides an assessment of the likely significant impacts of the proposed development on the ecology within the site boundaries, as well as in the general vicinity of the sites. The aims of this Ecological Impact Assessment are to:

- establish baseline ecological data for the proposed site and other relevant areas;
- determine the ecological value of the above features;
- assess the impact of the proposed development on ecological features of value;
- recommend mitigation measures to reduce or prevent the above impacts; and
- identify any residual impacts after mitigation.

5.2 METHODOLOGY

5.2.1 RELEVANT LEGISLATION AND POLICY CONTEXT

The assessment of the likely impacts of the proposed development on ecological resources has had regard to the following policy documents and legislation.

National and International Policy and Legislation

- Wildlife Act, 1976 and Wildlife (Amendment) Act (2000) including all amendments 1976-2011. In this document, the legislation is referred to collectively as the Wildlife Acts
- European Communities (Natural Habitats) Regulations 1997 including all amendments 1997-2011. In this document, the legislation is referred to collectively as the Habitats Regulations. These regulations transpose the EC Habitats Directive 92/43/EEC into Irish law
- EC Birds Directive 79/409/EEC
- European Communities (EIA) Regulations, including all amendments 1989-2011
- Flora (Protection) Order, 1999
- Planning and Development Acts, 2000-2010

Relevant Local Plans

- Kildare County Development Plan 2011-2017
- Kildare County Biodiversity Plan 2009-2013
- Good Practice Guidelines for Developers - Biodiversity and Development in Co. Kildare (2009)
- Leixlip Local Area Plan 2009-2015

5.2.2 RELEVANT GUIDELINES

The baseline ecology surveys, evaluation and impact assessment had regard to the following legislation and guidelines:

General

- Guidelines for Ecological Impact Assessment (IEEM, 2006);
- Advice Notes on Current Practice (in preparation of Environmental Impact Statements) (EPA, 2003); and
- Guidelines on the information to be contained in Environmental Impact Statements (EPA, 2002).

Habitats and flora

- Best Practice Guidance for Habitat Survey and Mapping (Smith et al, 2011)
- A Guide to Habitats in Ireland (Fossitt, 2000)
- Phase I Habitat Survey Techniques (Joint Nature Conservancy Council, 1993)
- River Habitat Survey in Britain and Ireland: Field Guidance Manual. (Environment Agency, 2003)

Fauna

- Bat Mitigation Guidelines for Ireland (NPWS, 2006)
- Bat Surveys: Good Practice Guidelines (UK Bat Conservation Trust, 2007)

- Guidelines for the Treatment of Bats during the Construction of National Road Schemes (NRA, 2005)
- Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes (National Roads Authority, 2006)
- Design Manual for Roads and Bridges: Mitigating Against Effects on Badgers (Highways Agency, 2001)
- Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (NRA, 2006)

5.2.3 DESK STUDY

A desk study was carried out to collect any available information on the local ecological environment. The following resources assisted in the production of this report:

- Ordnance Survey Ireland maps
- Aerial photography
- Data on species that are rare, protected or threatened located within the vicinity (up to 10km) of the proposed alignment, as held by the National Park and Wildlife Service (NPWS) Database and the NBN Gateway
- An Examination of the Rye Water Bridge at INTEL, Leixlip for the implications of repair work to the bridge upon fauna including kingfishers and bats (Brian Keeley & Donna Mullen June 2010).
- A Survey for Potential Vertigo Habitat on Lands owned by Intel, Leixlip, Co. Kildare (Moorkens, 2011)
- Ecological Impact Assessment of Ryebrook Substation and Pumping Station, Intel, Leixlip, Co Kildare (Scott Cawley 2011)
- Study For Flouride Sensitive Plant Species At Intel Ireland Facility And Adjoining Areas (Biosphere Environmental Services 2011)

5.2.4 FIELD SURVEYS

Field surveys were carried out in August and November 2011 to identify, describe and evaluate habitats in the study area. The survey methodology used was based on the Phase 1 Habitat survey methodology, contained in the Joint Nature Conservation Committee (JNCC) Handbook for Phase 1 habitat survey – a technique for environmental audit. The study area was also surveyed for signs of badger and otter use (i.e. latrines, sprainting sites, mammal paths) as well as breeding and resting places. Habitats were classified using habitat descriptions and codes published in 'A Guide to Habitats in Ireland' (Fossitt, 2000).

5.2.5 APPROACH TO ECOLOGICAL EVALUATION AND IMPACT ASSESSMENT

Field surveys were carried out in August and November 2011 to identify, describe and evaluate habitats in the study area. The survey methodology used was based on the Phase 1 Habitat survey methodology, contained in the Joint Nature Conservation Committee (JNCC) Handbook for Phase 1 habitat survey – a technique for environmental audit. The study area was also surveyed for signs of badger and otter use (i.e. latrines, sprainting sites, mammal paths) as well as breeding and resting places. Habitats were classified using habitat descriptions and codes published in 'A Guide to Habitats in Ireland' (Fossitt, 2000).

Site Evaluation Criteria

The criteria used to assess the ecological value and significance of habitats is shown in Table 5.1, which follows Guidelines for assessment of Ecological Impacts of National Road Schemes (Nairn & Fossitt, 2006) and is consistent with the approach recommended in the Guidelines for Ecological Impact Assessment (IEEM, 2006).

Rating	Qualifying Criteria
A	Internationally important Sites designated (or qualifying for designation) as SAC* or SPA* under the EC Habitats or Birds Directives. Undesignated sites containing good examples of Annex I priority habitats under the EC Habitats Directive. Major Salmon river fisheries. Major salmonid (Salmon, trout or char) lake fisheries.
B	Nationally important Sites or waters designated or proposed as an NHA or statutory Nature Reserves. Undesignated sites containing good examples of Annex I habitats (under EC Habitats Directive). Undesignated sites containing significant numbers of resident or regularly occurring populations of Annex II species under the EC Habitats Directive or Annex I species under the EC Birds Directive or species protected under the Wildlife (Amendment) Act 2000. Major trout river fisheries. Water bodies with major amenity fishery value. Commercially important coarse fisheries.
C	High value, locally important Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or significant populations of locally rare species. 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 EC Habitats Directive or Annex I species under the EC Birds Directive. Large water bodies with some coarse fisheries value.
D	Moderate value, locally important Sites containing some semi-natural habitat or locally important for wildlife. Small water bodies with some coarse fisheries value or some potential salmonid habitat. Any water body with unpolluted water (Q-value rating 4-5).
E	Low value, locally important Artificial or highly modified habitats with low species diversity and low wildlife value. Water bodies with no current fisheries value and no significant potential fisheries value.

Table 5.1 Site Ecological Evaluation Scheme

Impact Assessment Criteria

The impact significance for terrestrial and aquatic habitats has been assessed using the Guidelines for Ecological Impact Assessment (IEEM, 2006). Detailed Ecological Impact Assessment was undertaken for all Sensitive Ecological Receptors. Based on these guidelines, the criteria used to characterise impacts are outlined in Table 5.2.

Parameter	Categories
Type of impact	Positive/ Negative
Magnitude of impact	Size or amount of impact
Extent	Area over which impact occurs (may be the same as magnitude if whole habitat impacted)
Duration	Time over which impact is expected to last. For example, described as Short-term, Medium-term or Long-term in relation to relevant species/ habitat time-scales.
Reversibility	Temporary/ Permanent
Timing and frequency	Timing of impacts in relation to relevant life-stages or seasons
Likelihood of impact occurring	Near-certain: probability >95% Probable: probability 50-95% Unlikely: probability 5-50% Extremely unlikely: probability <5%

Table 5.2 Characterisation of Impacts

An impact is considered to be Ecologically Significant if it impacts the integrity or conservation status of an Ecologically Sensitive Receptor within a specified geographical area. If impacts are not found to be significant at the highest geographical level at which the Ecological Receptor has been valued, then the impacts may be significant at a lower level. For instance there may be a significant impact at a local level on a species which is not valued at an international level.

Flora and fauna species have been evaluated in relation to any legal protection they may be afforded (International or National), their conservation status and local abundance. For instance, a species that is listed on Annex II or IV of the EC Habitats Directive is considered to be of 'International' importance. As above, this does not mean that an impact will necessarily be significant at an International level.

5.3 EXISTING ENVIRONMENT

5.3.1 DESIGNATED AREAS

Candidate Special Areas of Conservation (cSAC) are designated under the Habitats Directive (92/43/EEC). The EC (Natural Habitats) Regulations (1997) enable the protection, conservation and, where possible and necessary, the restoration of certain habitats and/or species (habitats listed on Annex I, and species listed on Annex II, of the Habitats Directive). Designated SACs are compiled within a framework of protected areas known as Natura 2000.

Special Protection Areas (SPAs) are designated under the Birds Directive (79/409/EEC). They are protected for birds listed on Annex I of the Birds Directive, as well as for populations of regularly occurring migratory species. The Directive obliges Ireland to conserve wetlands, especially those of international importance. This Directive seeks to protect any such areas important for birds from potential impacts of proposed developments.

Proposed Natural Heritage Areas (pNHAs) are designations introduced under the Wildlife Act 1976 (as amended). Although many NHA designations are not yet fully in force under this legislation, they are offered protection in the meantime under planning legislation which requires that planning authorities give due regard to their protection in planning policies and decisions.

SITE NAME AND CODE	DESIGNATION	DESIGNATED FEATURES (HABITATS AND SPECIES)	LEGISLATION
Carton/Rye Water (01398)	cSAC & pNHA	Annex II Species including *Vertigo angustior* and *V. moulinsiana*, Trout and salmon spawning beds and White Clawed Crayfish at Leixlip. Woodland and Annex I mineral spring at Louisa Bridge.	EC Habitats Directive (92/43/EEC) Wildlife Act 1976 (as amended).
Royal Canal (2103)	pNHA	The canal NHA comprises the central channel and the banks on either side of it. A number of different habitats are found within the canal boundaries - hedgerow, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland. The Rare and legally protected Opposite-leaved Pondweed (*Groenlandia densa*) (Flora Protection Order 1987) is present at one site in Dublin, between Locks 4 and 5. *Tolypella intricata* (a stonewort listed in the Red Data Book as being Vulnerable)	Wildlife Act 1976 (as amended).

Table 5.3 Designated Areas within approximately 10km of the study area

5.3.2 RECORD OF PROTECTED, RARE AND OTHER NOTABLE FLORA AND FAUNA SPECIES

NPWS Data

A search was undertaken of records of Red Data Book and Protected species held by the NPWS and the NBN Gateway. Relevant records from the 10km x 10km grid squares occupied by the study area (N93), and those within 1km of the Proposed Scheme, (003) are listed in Table 5.4.

SCIENTIFIC NAME	COMMON NAME	LOCATION & DATE*	GRID REF.	DISTANCE FROM PROPOSED SCHEME	CONSERVATION STATUS
Galeopsis angustifolia	Red Hemp Nettle	Kildare, Leixlip 1896, Knockmaroon Hill 1866, Clonsilla 1884, Peatown 1836.	N92, N93, O03	Various	FPO, RDB V.
Lutra lutra	Otter	Naas 1992	N92	>5km	Annex II, IV.
Hypericum hirsutum	Hairy St. John's Wort	Carton 1894, 1991, St Catherines Wood 1991, Luttrellstown estate 1899, Leixlip waterfall 1799, Lucan Demesne 1893.	N9637	3km	FPO, RDB V.
Viola hirta	Hairy Violet	Carton 1894, Furry Glen, Knockmaroon Hill 1799.	N96, O03	Various	FPO, RDB V.
Acinos arvensis	Basil Thyme	Clonsilla 1895	O03	>5km	FPO, RDB V.
Hordeum secalinum	Meadow Barley	Scribblestown 1922, Castleknock 1866.	O03	>5km	FPO, RDB V.
Stachys officinalis	Betony	Abbotstown 1802.	O03	>5km	FPO, RDB V.

**Where there are several records for the same location the most recent date is given.*
FPO: Plants listed on the Flora (Protection) Order (1999). RDB: Irish Red Data Book: 1. Vascular Plants. (Curtis & McGough, 1988; updated 2005): E = Endangered, V = Vulnerable, R = Rare

Table 5.4 Records of Rare and Protected Species from the NPWS Database

Many of these species have been recorded from single sites, several kilometres away from the two sites.

Additional important plant species recorded on the Rye Water cSAC NATURA 2000 Data Form include Green Figwort *Scrophularia umbrosa* and Blue Fleabane *Erigeron acer*. Both species are listed as on IUCN Red Data List as Endangered in Ireland.

Bat data
Data held by Bat Conservation Ireland indicates that there are several roosts in the Leixlip area for species including Leisler's bats *Nyctalus leisleri*, Common Pipistrelle Bat *Pipistrellus pipistrellus* and Daubenton's Bat *Myotis daubentonii*. Soprano pipistrelle Bat *P. pygmaeus* and Natterer's Bat *M. nattereri* have also been recorded in the Leixlip-Maynooth-Celbridge area.

Bat Surveys were undertaken within the Intel site in June 2010 and August 2011 (Keeley & Mullen, 2010 and Scott Cawley, 2011). The 2010 survey focused on a small stone bridge to the east of the proposed pumping station. No roosts were identified however Soprano Pipistrelle Bats were noted to be the most common species using the area with Daubentons, Natterer's and Leisler Bats also recorded to be within the area.

The 2011 surveys focused on the south western areas of the Intel compound outside of the proposed development area. Soprano Pipistrelle, Common Pipistrelle, Leisler's and a Myotis Bat species were recorded using the area but no roosts were identified within the area.

5.3.3 HABITATS

Proposed Development Site
All of the lands in the FAB 24 development site were deemed to be of low ecological value. The lands are within the curtilage of the Intel industrial plant and therefore consist of built land. The extension to the existing switchroom will also be constructed on an existing hard standing area.

The site for the proposed new water tanks is located in an existing contractor's compound which consists of a hard standing area. The site is bounded to the east by a man made berm that separates the Intel owned lands from the Rye Water/Carton SAC and the Royal Canal. The berm is planted with a mixture native species for landscaping and screening purposes.

The proposed new hydrogen tank will be located adjacent to an existing hydrogen tank. Habitats within this site include recolonising bare ground and hardstanding area. A habitat map for the proposed hydrogen tank site and surrounding lands is shown in Figure 5.1.

Lands Surrounding the Proposed Development Site

Very little natural habitat exists within the Intel campus due to the progressive development. The Rye Water forms a natural boundary to the north of the campus. The ecological status of the Rye Water is outlined in Section **Error! Reference source not found.**. A mixture of natural and managed habitats form a buffer between the built up, hard surface areas of the plant and the river. The dominant habitats within this area include woodland and grassland.

Grassland

The north eastern section of the Intel campus, between the campus itself and the Rye Water is at present undeveloped and consists of a mosaic of built land, recolonising bare ground and dry meadows and grassy verges (GS2[1]). These lands are of Local Importance (local value) and undergo infrequent levels of physical disturbance. The main habitat consists of Dry Meadows and Grassy Verges (GS2) dominated by False Oat Grass *Arrhenatherum elatius*, Red Fescue *Festuca rubra*, Meadow Fescue *Festuca pratensis*, Cocksfoot *Dactylis glomerata*, Creeping Buttercup *Ranunculus repens*, Yorkshire Fog *Holcus lanatus*, Silverweed *Potentilla anserine* and Nettles *Urtica dioica*. Other species noted in this area include Red Bartsia *Odontites* vernus, Ribwort Plantain *Plantago lanceolata* and Scarlet Pimpernel *Anagallis arvensis*.

A notable feature within this area is a large spoil mound. This has recolonised with vegetation hosting GS2 habitat dominated by Red Fescue, False Oat Grass, Meadow Fescue with Nettle, Creeping Buttercup, Yorkshire Fog, Tufted Vetch *Vicia cracca*, Ribwort Plantain and Black Meddick *Medicago lupulina*.

The proposed location of the new Hydrogen tank comprises an area of recolonising bare ground with a range of species including Brambles, Coltsfoot *Tussilago farfara*, Yellow Wort *Blackstonia perfoliata* Ribwort Plantain, Nettles, Creeping Buttercup, Creeping Cinquefoil, Cleavers *Galium aparine*, Great Willowherb *Epilobium hirsutum*, Meadow Vetchling *Lathyrus pratensis*, Cocksfoot, and Ragwort *Senecio jacobea*.

A population of Blue Fleabane was recorded on the Rye River flood plain at the base of the eastern slope of the large spoil heap during survey's carried out in 2011 (Scott Cawley, 2011). This endangered plant species is a Red Data Book species and is likely to be of County importance.

Woodland

An area of broad-leaved woodland is located along the southern bank of the Rye Water. The woodland occurs in a narrow strip on the steep slope between the river and the perimeter of Intel's site. It has an average width of 30m. The dominant woody species present are Ash (*Fraxinus excelsior*), Poplar *Populus sp.*, Hawthorn *Crataegus monogyna* and Blackthorn *Prunus spinosa*. A further seven species of woody plant are present, including Guelder Rose *Viburnum opulus* and Hazel *Corylus avellana*. Some limestone outcrops occur within the woodland and a typical breeding bird community is present. Though narrow, this woodland has a high local ecological value and is included within the statutory designation of the Rye Water/Carton SAC.

A mature strip of native and non-native deciduous woodland (WD1) forms the northern boundary of the proposed site of the Hydrogen tank. Species include Ash, Sycamore *Acer pseudoplatanus*, Poplar *Populus spp*, Horse Chestnut *Aesculus hippocastanum*, Elder *Sambucus nigra* and Crack Willow *Salix fragilis*. The ground flora is dominated by Nettles with bare soil with leaf litter and Bramble in more open areas.

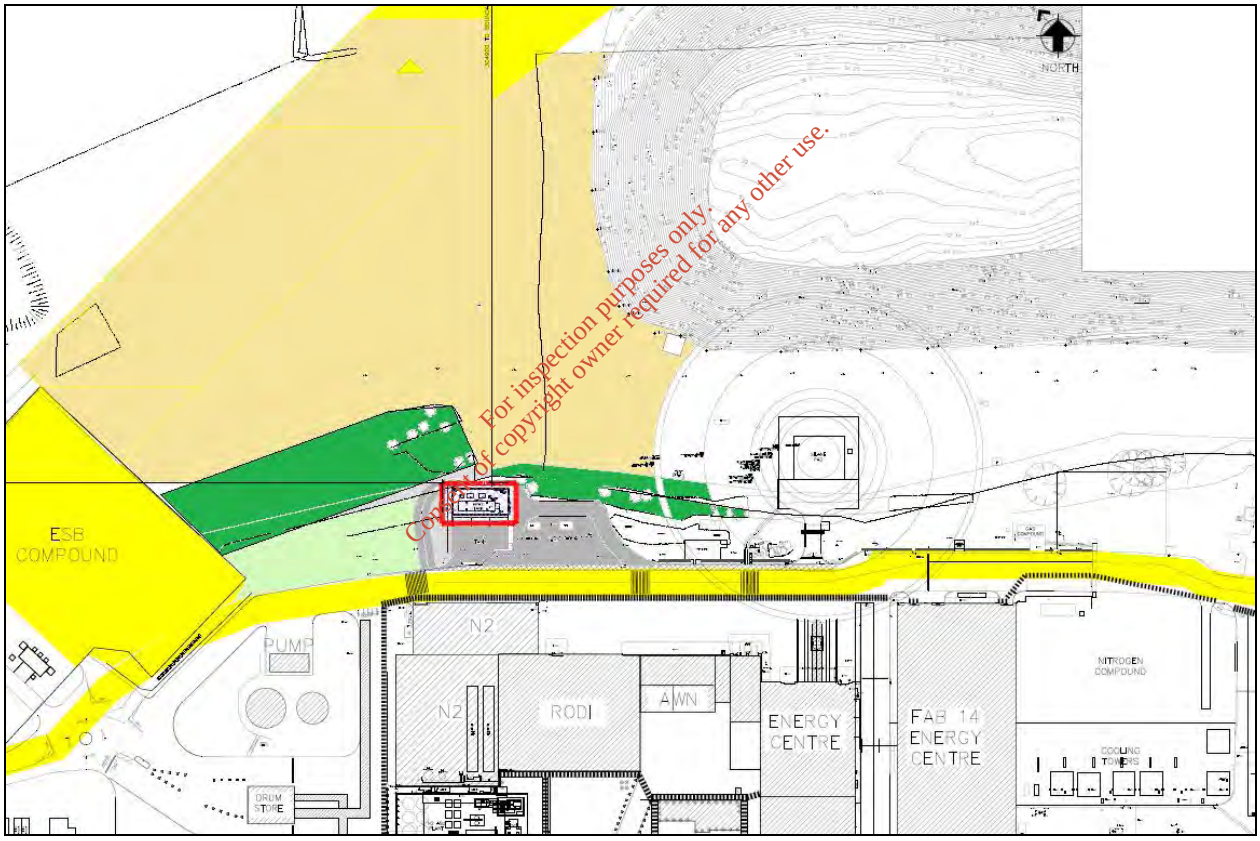
[1] Habitat code - referring to Fossitt Habitat classification system

The berm located to the east of the proposed site has been planted with a variety of species for landscaping and screening purposes. Species present include ash, silver birch *Betula pendula* and whitebeam *Sorbus sp.*

5.3.4 FAUNA

Due to the presence of artificial lighting, moving vehicles, pedestrians and the continuous operation of the Intel facility, there are relatively high levels of disturbance within the site. Mammals and birds are unaffected or habituated to disturbance at the site perimeter. Birds recorded moving through the area north of the site proposed for the new hydrogen tank (Scott Cawley 2011) included Robin *Erithacus rubecula*, Rook *Corvus frugilegus*, Bullfinch *Pyrrhula pyrrhula*, Chiffchaff *Phylloscopus collybita*, Wren *Troglodytes troglodytes*, Song Thrush *Turdus philomelos*, Swallow *Hirundo rustica*, Blue Tit *Cyanistes caeruleus*, Buzzard *Buteo buteo*, Raven *Corvus corax* and Sparrow Hawk *Accipiter nisus.*

A possible Badger *Meles meles* sett was previously recorded approximately 100m to the north (Scott Cawley, 2011). A Badger scat was observed c.300m to the northwest of the study area but there was no evidence that badgers use the proposed development site. Fox Vulpes vulpes are common in the area. Other mammals protected under the Wildlife Act 1976 (as amended) that may potentially occur in the vicinity of the site include Hedgehog *Erinaceus europaeus*, Pygmy Shrew, *Sorex minutus*, Irish Hare *Lepus timidus hibernicus* and occasionally Stoat *Mustela erminea*.



Legend

Mixed Broadleaf Woodland (WD1)

Dry Meadows and Grassy Verges (GS1)

Recolonising bare ground

Hardstanding areas

Location of Hydrogen Tank

Figure 5.1 Habitat Map of Proposed Hydrogen Tank Development Site and Surrounding Lands

5.3.5 SURVEY FOR VERTIGO SP AND POTENTIAL VERTIGO HABITAT

Two Annex II protected species (*V. moulinsiana* and *V. angustior*) are known from the cSAC, at Louisa Bridge and within the Carton estate (*V. moulinsiana*). The species have not been recorded within lands owned by Intel to date, but there has never been a full survey of habitat within the Intel lands for Vertigo species. The present survey by Dr. Evelyn Moorkens was carried out at the proposed extension the ESB compound at the site and the proposed new pumping station at the site. The surrounding habitat areas including the cSAC riparian zone from the proposed pumping station to the western site boundary was also surveyed for molluscs. The survey locations are shown in Figure 5.2.

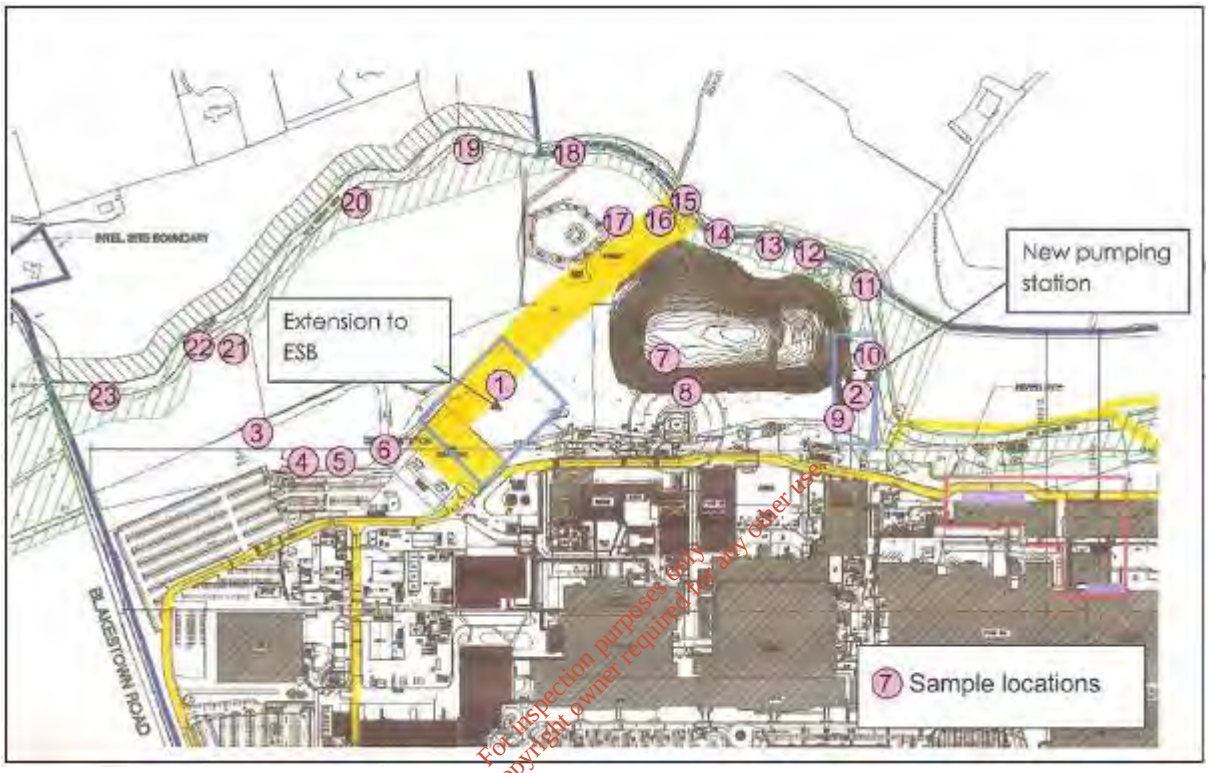


Figure 5.2 Site Sampling Locations for *Vertigo* sp.

5.3.6 THE RYE WATER – BIOLOGICAL WATER QUALITY AND FISHERIES STATUS

Overview

An annual limnological survey of the Rye Water was undertaken by AQUENS Ltd. in June and July 2010. The main focus of the study was to assess the water quality of the Rye Water and tributary using the macroinvertebrate community as bioindicators and assess the salmonid populations in the long-term established surveyed stretches.

Water Quality

Monitoring of water quality has been carried out by the Environmental Protection Agency (EPA) since 1971 at Sandford's Bridge (upstream of the Intel site) and Leixlip Bridge (downstream of the Intel site). During this time, both sites have had slightly or moderately polluted water, varying between years. At present, the biological rating (Q value) at Leixlip Bridge is 3, indicating moderate pollution, while at Sandford's Bridge, the rating was 3-4 (Moderate status) in 2002. The River Waterbody Status has been determined by the EPA to be bad. Pollution has been attributed to non-point agricultural sources upstream of the Intel site.

Intel carries out an annual survey of the Rye Water River chemical water quality at various locations both upstream and downstream of the Intel site. The monitoring carried out demonstrates that discharges from the Intel site do not impact upon water quality and any impairment of water quality within the Intel site boundary is due to upstream contributions.

Biological Water Quality

Monitoring of biological water quality has also been carried out by AQUENS Ltd on behalf of Intel. A macroinvertebrate community assessment of the Rye Water was undertaken by AQUENS Ltd. in June and July 2010. Samples were collected from six sites, three sites upstream of the Intel facility, one at the Stoneland Bridge within the Intel property and one site downstream of the Intel facility at the Aquaduct at Leixlip. The water quality results from 2010 indicate that water quality both upstream and downstream of the Intel site is Q-value 3-4, which is consistent with the EPA's evaluation of water quality along the same stretch of the river.

Fish Studies

Electrofishing operations were conducted by AQUENS Ltd. over two sections of the Rye Water located downstream of the Stoneland Bridge. Overall, the Rye Water supports a self sustaining salmonid stock. Both salmonid species, brown trout *Salmo trutta* and Atlantic salmon Salmo salar were present, along with five other species of fish; minnow (*Phoxinus phoxinus*), stoneloach (*Neomacheilus barbatulus*), lamprey (*Lampetra* spp.), eel (*Anguilla anguilla*) and stickleback (*Gasterosteus aculeatus*). The Rye Water in this area supports populations of Freshwater Crayfish and Lamprey (both Habitats Directive Annex II species) (Brian Beckett Inland Fisheries Ireland, pers. comm.)

5.3.7 SUMMARY OF ECOLOGICAL EVALUATION

Table 5.5 provides a list of the ecological evaluation for all relevant habitats and species, and identifies the Sensitive Ecological Receptors. Sensitive Ecological Receptors (those classified as Local (high) or above) are defined as per the criteria set out in Table 5.5, which takes into consideration legal protection, conservation status and local abundance of ecological features.

Habitat/ species	Ecological value	Highest level of ecological value	Sensitive receptor?
Habitats			
Built land	FAB 24 building. Not suitable for nesting birds or bats.	E	No
Recolonising Bare ground	At hydrogen tank site only	E	No
Surrounding habitats	The adjacent habitats comprise grassland and woodland to the north and east which is planted with native and non-native species.	D	No
Rye Water/Carton SAC	International Importance.	A	Yes
FLORA SPECIES			
Ecological data search	Green Figwort (Red data species) known to occur locally at the river but not near the site.	n/a	No
Field survey	No rare or protected plant species were recorded during the survey. The habitats present were not considered likely to support rare or protected plant species.	n/a	No
Fauna species			
Bats	No roosts confirmed and area at FAB 24 development site deemed to be unsuitable for bats. Perimeter vegetation at hydrogen tank site are more suitable with good quality habitat for commuting and/or foraging	International	Yes – at hydrogen tank site only
Other mammals	Deer, badgers, rabbits all present in lands surrounding the site.	National	No
Birds	No suitable habitat present at FAB 24 development site that supports birds. Perimeter vegetation at hydrogen tank site likely to be breeding bird habitat	Wildlife Act 1976 as amended; Kildare County Development Plan.	Yes
Other protected species	The Rye Water supports a number of Internationally protected species such as salmon and white clawed crayfish	International	Yes

Table 5.5 Ecological Evaluation of Habitats and Species and Identification of Sensitive Receptors

5.4 POTENTIAL IMPACTS OF THE PROPOSED SCHEME

5.4.1 OVERVIEW

Impacts on Habitats and species may occur during either the construction or operation phases of a development. As per IEEM guidelines, impacts have been assessed for 'Ecologically Sensitive Receptors' only, as listed in the summary of ecological evaluation

5.4.2 IMPACTS ON NATURA 2000 SITES

An appropriate assessment of the impact of the proposed development on the integrity of the Natura 2000 network of sites was carried out in accordance with Article 6 of the Habitats Directive. Further details of this assessment are given in the Natura Impact Statement (NIS) submitted with this application.

The assessment found that the proposed development will not adversely affect the integrity of the Rye Water Valley/Carton SAC, having regard to the methodology proposed in the construction and operation

of the proposed development together with the proposed mitigation measures outlined in this EIS and the Natura Impact Statement.

5.4.3 LOSS OF HABITAT

The majority of the works carried out will take place within existing built land and hardstanding areas. This will not result in the loss of any sensitive habitats. Habitat loss will be confined to the loss of a small area of recolonising bare ground where the new hydrogen tank will be located. The loss of this habitat will have no significant impact.

5.4.4 DISTURBANCE OF SPECIES

Due to the presence of artificial lighting, moving vehicles, pedestrians and the continuous operation of the Intel facility, there are relatively high levels of disturbance within the site and in general mammals and birds are unaffected or habituated to the disturbance.

Construction activities at the site of the new hydrogen tank could cause localised disturbance to fauna in the surrounding area. If work commences during the bird breeding season (generally accepted to be 1st March to the 31st August) this is likely to disturb breeding birds using the nearby woodland habitats. This would be expected to have a probable, significant, short-term impact at a local level but there is likely to be an existing degree of habituation to regular traffic and noise levels currently on the site so this impact may not be across the whole area.

Some bat species are sensitive to light and strong lighting. This would only affect bat species if inappropriate lighting is used during construction works at the site of the new hydrogen tank, if such works are carried out at night This would be likely to cause a significant short to medium term impact at a local level if not managed appropriately

5.4.5 EXCAVATION AND CONSTRUCTION WORKS

During construction, inappropriate storage of excavated material, including location and storage technique may result in the potential for material to escape downstream to the River Rye.

If sediment was to accidently escape downstream into the watercourse this is likely to have a short to long-term significant impact on the freshwater habitat, depending on the type of material and quantity released. Consequently such an incident would have the potential to negatively impact upon fauna using the watercourse including Salmonid species, White-clawed Crayfish and Otters.

5.4.6 SCHEDULED EMISSIONS AIR AND WATER

No process effluent is discharged to the Rye Water. Process effluent is treated on site to strict parameters and in accordance with Intel's Integrated Pollution Prevention and Control (IPPC) Licence. This effluent is pumped and further subjected to treatment in the adjacent Leixlip Municipal wastewater treatment plant (MWWTP).

During the operational phase, emissions to atmosphere will arise from both process and utility sources from the site. Typical emissions include carbon dioxide (CO_2) and nitrous oxide (N_2O) and process gases, principally compounds known as perfluorocarbons (PFCs). Ambient air has been monitored on an on-going basis to ensure compliance with regulatory ambient air quality standards designed to protect human health and vegetation. The ambient monitoring results have demonstrated that the background air quality with existing operations is good.

Biosphere Environmental Services carried out a survey of fluoride sensitive plant species at the Intel facility and adjoining areas in May 2011. The study showed that three plant species which are identified as being sensitive to HF occur widely in the immediate area of the Intel site. These are yellow iris (*Iris pseudacorus*) and two species of willow (goat willow and grey willow (*Salix sp.*)). Yellow iris is considered sensitive to concentrations around 0.8-1.0 µg m-3, while the willows may be injured by concentrations around 1 µg m-3 in spring.
Examination of emerging leaf tissue of these plants both within the Intel site and in adjoining areas to the west (up to 1.5 km approximately from source of Intel emissions) and east (1 km approximately from the source of Intel emissions) did not detect any leaf damage that could be linked to high HF levels.

Overall, the FAB 24 conversion is not anticipated to significantly affect the aqueous environment or ambient ait during its operation and will be managed through the IPPC licensing regime.

5.5 MITIGATION MEASURES

5.5.1 MEASURES FOR PROTECTING BATS

In order to minimise the extent on light spill onto perimeter vegetation during night time works, all lights that are pole mounted will be directional and/or cowled to ensure that light is directed downward and inwards. Lights will be programmed or otherwise to be off unless required. An Ecologist will check the lighting pattern once assembled and will make recommendations if perimeter light levels exceed 0.1 lux.

5.5.2 PROTECTION OF BREEDING BIRDS

Best practice recommends that breeding bird habitats (e.g. hedgerows, woodland, trees, scrub and grassland and also including buildings used by breeding birds) should not be removed between the 1st March and 31st August, primarily to avoid impacts on nesting birds and breeding small mammals. Where the construction programme does not allow this time restriction to be observed, then these areas must be inspected by a qualified ecologist for the presence of breeding birds or mammals prior to clearance. Where any nests are found the appointed ecologist will provide recommendations as to whether a licence is required for vegetation removal.

5.5.3 MEASURES FOR PROTECTING SURFACE WATERS

Best practice shall be implemented at all times in relation to any activities that may impact on surface water (stream and river) or riparian habitats.

- Comprehensive surface water management measures (GDSDS study recommendations) shall be implemented at the construction and operational stage to prevent any pollution of local surface waters.
- Class I petrol/oil interception (and possibly hydrobrake controls) should be in place on primary surface water discharges to protect receiving freshwaters in terms of water quality.
- Precautions must be taken to ensure there is no entry of solids, during the connection of pipe-work, to the existing surface water system.

5.5.4 MEASURES FOR REDUCTION AND PREVENTION OF SUSPENDED SOLIDS POLLUTION

The key factors in erosion and sediment control for land based works are to intercept and manage runoff. This limits the potential for soils to be eroded and enter streams in runoff. The following measures will be implemented when any construction activities are taking place in close proximity to the Rye Water.

- The permanent fence demarcating the boundary of the SAC will be retained and the significance of this fence will be made known to contractors where relevant.
- Where construction occurs adjacent to the Rye Water i.e. at the extension existing Switchroom, temporary hoarding of an impermeable nature will be installed at the fence demarcating the boundary of the SAC to ensure that no silt or spoil will be washed into the Rye Water
- No works or modifications of any nature are permitted in this designated area. No disruption of the riverbed, either through the installation of services or the passage of traffic across the river will be permitted without the prior approval of NPWS via the Intel Environmental Department.
- Disposal of spoil or storage of soils shall not be carried out in any location where runoff can occur into watercourses.
- Any disposal of spoil, not detailed in the planning permission application, and in proximity to the designated site will not be carried out without the prior approval of the Intel Environmental department. Where spoil is spread in an area adjacent to the River Rye, settlement ponds will be provided in accordance with the requirements of NPWS. These should use settlement ponds already in place for construction activities if available

- The guidelines document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites" must be consulted when planning to undertake any works that could affect the river (www.fishingireland.net/environment/constructionanddevelopment.htm)
- Where possible, silty water will be disposed of to the foul sewer, a TEDL (Trade Effluent Discharge Licence) for the discharge (if required) will contain information relating to the volume disposed of and will be in accordance with Local Authority conditions.

5.5.5 MEASURES FOR REDUCTION OR ELIMINATION OF POLLUTION WITH OTHER SUBSTANCES ASSOCIATED WITH THE CONSTRUCTION PROCESS

Best practice to prevent contamination of surface and groundwaters by spillages of fuels, lubricants and other chemicals will be implemented on the site. These measures will include the following:

- Raw or uncured waste concrete shall be disposed of by removal from the site.
- Fuels, lubricants and hydraulic fluids for equipment used on the construction site, as well as any solvents, oils, and paints shall be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to codes of practice.
- All construction tank and drum storage areas shall be rendered impervious to the materials stored therein. No bulk chemicals are to be stored in the demolition area. Oil and fuel storage tanks shall be stored in designated areas, and these areas shall be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) shall be diverted for collection and safe disposal.
- In the event of a spillage, drainage from bunded areas shall be diverted for collection and safe disposal.
- The integrity and water tightness of all the bunding structures and their resistance to penetration by water or other materials stored therein shall also be tested and demonstrated. All fuel oil fill areas will have an appropriate spill apron
- Fuelling and lubrication of equipment shall not be carried out close to watercourses.
- Any spillage of fuels, lubricants of hydraulic oils shall be immediately contained and the contaminated soil removed from the site and properly disposed of.
- Waste oils and hydraulic fluids shall be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- Foul drainage from site offices etc. shall be removed to a suitable treatment facility or charged to a septic tank system constructed in accordance with EPA guidelines.
- Sites for use as storage areas, machinery depots, site offices or the disposal of spoil shall be located at least 50m from the nearest watercourse.
- Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area (where possible) of the site, which will be away from surface water gulleys or drains. In the event of a machine requiring refuelling outside of this area, fuel will be transported in a mobile double skinned tank. An adequate supply of spill kits and hydrocarbon adsorbent packs will be stored in this area. All relevant personnel will be fully trained in the use of this equipment. Guidelines such as "Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001)7 will be referred to.
- Any concrete required will be mixed off–site and imported to the site. Wash down and washout of concrete transporting vehicles will take place at an appropriate facility offsite.

5.5.6 MEASURES FOR CONTROLLING WASTE AND SOIL

Measures for controlling waste and soil will include:

- Where concrete removal and soil stripping occurs the resulting excavated material will be separated into concrete, topsoil and subsoil stockpiles.
- Temporary storage of spoil and hardcore will be carefully managed in such a way as to prevent any potential negative impact on the receiving environment and the material will be stored away from any surface water drains.
- In the event of any soils or hardcore being taken off site, the soils will be removed and disposed of by contractors licensed under the Waste Management Act of 1996 (as amended 2001), the

Waste Management (Facility Permit & Registration) Regulations of 2007 and the Waste Management (Collection Permit) Regulations of 2007. The issuing of such a permit to contractors allows them to use such material for landscaping and land reclamation, subject to conditions defined in the permit if the material has been classified as suitable for this use. Otherwise, the material will be classified for disposal at a suitably licensed landfill and removed off-site by a licensed waste contractor. In terms of surplus soil, any residuals will be stored within appropriate storage areas of sufficient capacity prior to removal by a suitably licensed waste management contractor for off-site treatment/recycling/disposal.

- A construction and demolition waste management plan will be developed in accordance with the Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (DoEHLG, 2006) to ensure that all construction waste is stored, managed, moved, reused or disposed of in an appropriate manner by appropriate contractors in accordance with all relevant waste legislation.

5.6 MEASURES TO PREVENT ENVIRONMENTAL INCIDENTS / MINIMISE IMPACT IN THE EVENT OF INCIDENT

Systems are built into the design of the site to ensure that environmental media are not impacted in the event of a spillage or fire. This applies to all production areas of the site. The systems are based on the principle of segregating potentially contaminated surface waters and ensuring suitable storage and containment is present in the event of contaminated material being generated.

5.6.1 DOUBLE CONTAINED SYSTEMS

All chemicals are stored in double contained or bunded areas with monitors in place to identify leaks in containment areas. Bunds storing chemicals are lined with chemical resistant coating and a certified engineer checks the integrity of the bunds as part of the conditions under the existing IPPC licence (Register P0207). Process tools that use hazardous chemicals are also held in contained areas.

5.6.2 SEGREGATED SURFACE WATER SYSTEMS

Two types of surface water collection systems are in place onsite. The uncontained surface water system takes surface water from areas of the plant where chemicals are not stored. These are discharged to the Rye Water via a retention pond. The contained surface water system serves areas where chemicals are used, stored or transferred with the exception of the western service road. The contained system allows surface water to be rerouted to either dedicated underground tanks in the service yard or the AWN of each FAB in the event of a chemical spill or fire. Contaminated waters are therefore prevented from reaching the Rye Water, ground or groundwater. Approved contractors check the integrity of the contained systems as required by existing IPPC licence conditions. These integrity checks are reported to the Environmental Protection Agency (EPA) within the AER.

5.6.3 GRIT AND OIL INTERCEPTORS AND THE RETENTION POND

To ensure the quality of discharges to the Rye Water, all surface waters are discharged to the River through a retention pond having passed through grit and oil interceptors. The outlet of the retention pond can be closed in the event of a spill or fire.

5.6.4 TANK OVERFILL ALARMS AND SPILL APRONS

To minimise the potential of overfilling any chemical-containing tanks, all tanks are fitted with high fill alarms connected to the FMS system. In the unlikely event of any overfill or spillage, this will be captured in the bunded areas. The transfer of material to road tanker for removal on-site is also carried out in spill aprons connected to the contained surface water system.

5.6.5 MANAGEMENT SYSTEMS AND TRAINING

A comprehensive environmental management system is in place to ensure staff is aware of how to prevent releases and is certified to the international standard ISO 14001. The management system includes documented procedures to ensure operational control of activities is maintained and best practice is carried out at all times.

Intel has also developed training programmes that are aimed at all staff levels within the organisation. The training packages include modules for best practice, general environmental awareness and emergency response.

5.6.6 EMERGENCY RESPONSE

Trained members of the emergency response team (ERT) are available onsite 24 hours a day to coordinate and manage any environmental incident and to minimise the consequences should an incident occur. The effectiveness of the environmental management and containment systems in preventing uncontrolled releases to the environment is demonstrated in the low number of incidents that have occurred to date.

5.7 RESIDUAL IMPACTS

The design of the development and specified mitigation measures will reduce impacts to sensitive ecological receptors from the construction and operation of the proposed development. Residual impacts may still occur with regard to the disturbance of breeding birds at the using woodland near the proposed new Hydrogen tank site as a result of noise or visual disturbance. It is likely that there is an existing level of tolerance by birds in this area and that breeding may not be curtailed to a significant level. The impact is predicted to be short-term and localised.

6. SOILS, GEOLOGY AND HYDROGEOLOGY

6.1 INTRODUCTION

This section of the Environmental Impact Statement (EIS) was undertaken by AWN Consulting Limited, on behalf of Intel to assess the impact of the proposed FAB 24 Conversion on the surrounding soils, geology and groundwater environment. This impact assessment applies to the future waste building only, as excavations will be occurring only in this area.

The potential impacts and mitigation measures for soils, geology and groundwater during both the construction and operational phases of the proposed development are set out in the following sections.

6.2 ASSESSMENT METHODOLOGY

The assessment of the potential impact of the proposed development on soils, geology and hydrogeology was carried out according to the methodology specified in the following guidance documents, the references of which are detailed at the end of this chapter:

- Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Statements (2002)[1]; and
- EPA Advice Notes on Current Practice (in the Preparation of EIS) (2003)[2]

The following sources of information were consulted to establish the baseline environment:

- The Geological Survey of Ireland (GSI) well card and groundwater records for the area were inspected, with reference to hydrology and hydrogeology[3];
- EPA water quality monitoring data for watercourses in the area[4];
- Chemical water quality sampling carried out in September/October 2007 and April 2008
- Water Framework Directive Monitoring Programme, EPA 2006[5];
- Eastern River Basin District Characterisation Reports[5];
- Eastern River Basin District Management System Policy and Legislation Report[5];
- Geology in Environmental Impact Statements – A Guide[6]; and
- Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001)[7].

The collection of baseline data (soils, geology and hydrogeology contained within the study area) was undertaken by focusing upon a review of the following sources:

- Ordnance Survey of Ireland Discovery Series 1:50,000 Map Series, No.55, Kildare, Laois, Offaly, Wicklow;
- Geological Survey of Ireland - Geology of Kildare Wicklow by McConnell and M.E. Philcox (1994); and
- GSI, Kildare - Wicklow, Sheet 16, 1:100,000.

From the GSI groundwater database, the following information was obtained:

- Soil Map;
- Bedrock Geology Maps;

[1] EPA (2002) Guidelines on the Information to be Contained in Environmental Impact Statements, Environmental Publications, Dublin
[2] EPA (2003) Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), Environmental Publications, Dublin
[3] Geological Survey of Ireland, www.gsi.ie Online Groundwater Database
[4] EPA (2002) Water Quality Database, Johnstown Castle Estate, Wexford
[5] EPA (2006) Water Framework Directive Monitoring Programme
[6] Institute of Geologists of Ireland (2002) Geology in Environmental Impact Statements – A Guide
[7] CIRIA, (2001), Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors

- Quaternary (Subsoils) Maps;
- Well Card Database (Groundwater Wells);
- Historical Geological 6 inch:1 mile maps; and
- Database of Site Investigations/Surveys.

In addition, the following reports and logs were made available:

- Reports and information provided by Intel, which included the following:
  - Extracts from Intel Ireland IPPC Licence Review 2011;
  - Extracts from the report Groundwater Quality Assessment at Intel Ireland Ltd, Leixlip, Co. Kildare. No. 2 Biannual Monitoring. August 2009 by TMS Environment Ltd (February 2010);
  - Extracts from the report Groundwater Quality Assessment at Intel Ireland Ltd, Leixlip, Co. Kildare. No. 1 Biannual Monitoring. February 2009 by TMS Environment Ltd (May 2009); and
  - Borehole logs for the site investigation carried out by S. Kelly & Sons in 1994 and ESI in 2003 at the Intel facility.

6.3 RECEIVING ENVIRONMENT

6.3.1 BEDROCK GEOLOGY

Reference to the GSI Bedrock Geology Map for Kildare and Wicklow (Sheet 16) indicates that the subject site is underlain by Lower Carboniferous (Chadian to Brigantian Stage) Calp Limestones. This geological formation comprises dark grey, fine grained, argillaceous limestones with interbedded fossiliferous shales. Based on information from the GSI[8], the thickness of the Calp is around 50m. The Bedrock Geology Map is shown in Figure 6.1 below.

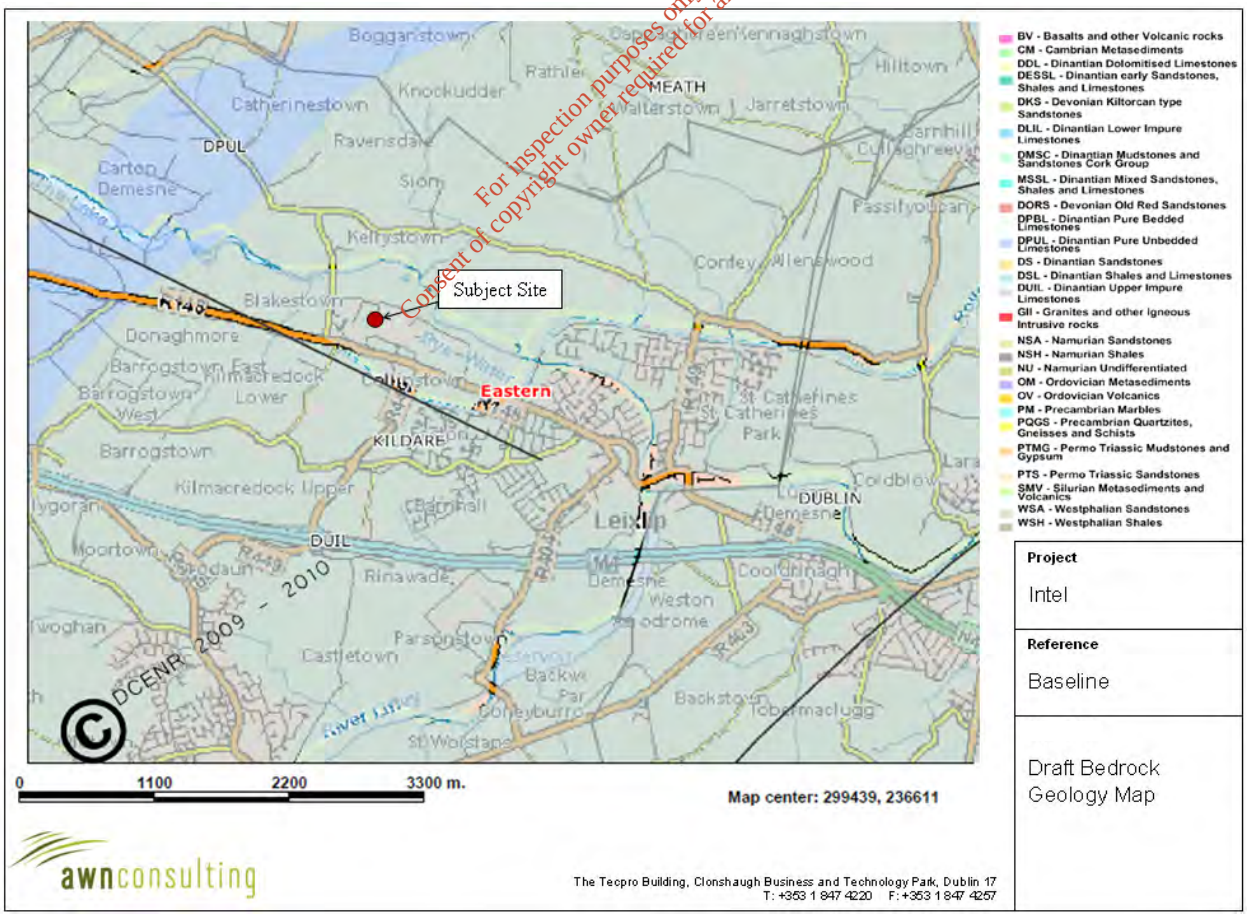


Figure 6.1 Bedrock Geology Map

[8] Geology of Kildare-Wicklow by B. McConnell and M.E. Philcox (1994). Publication by Geological Survey of Ireland.

Reference to the GSI publication Geology of Kildare-Wicklow by B. McConnell and M.E. Philcox (1994) indicates that Calp formed in the basins in the deeper ocean where thick sequences of muds and muddy limestones formed. Clay forms a significant component in argillaceous limestone.

Previous site investigations at the Intel facility have confirmed the presence of limestone bedrock at the site. The grey limestone encountered was described as dense, hard in nature and included interbedded black argillaceous limestones. Limestone bedrock was typically encountered within 3m to 4m of the ground surface at the Intel facility. Towards the southern side of the River Rye, the top elevation of the limestone was found at greater depth and was overlain by a thicker sequence of glacial till.

Geological faults are not indicated on the GSI bedrock geology maps beneath the subject site but a geological fault is indicated within circa 0.5km to the south of the subject site. A geological fault is also indicated approximately 3.5km to the southeast of the subject site (near Lucan). Geological faults in the area would be expected to influence the local hydrogeological regime to some extent because they would facilitate groundwater flow. It should be noted, however, that the location of geological faults on bedrock maps by the GSI is indicative only.

According to the GSI National Draft Gravel Aquifer Map for the region, the subject site is not underlain by a gravel aquifer.

According to the GSI, the area to the northwest of the Intel facility is underlain by (Chadian-Brigantian) Tober Colleen Formation, which comprises calcareous shale and limestone conglomerate. Waulsortian Limestones, which comprise massive unbedded fine-grained limestone, occupy the area to the further northwest.

6.3.2 DRIFT GEOLOGY

The Quaternary geological period extends from about 1.5 million years ago to the present day and can be sub-divided into the Pleistocene Epoch, which covers the Ice Age Period to 10,000 years ago, and the Holocene Epoch, which extends from 10,000 years ago to the present day.

As the ice travelled over the ground, it eroded the underlying bedrock, which resulted in the formation of sediment beneath and within the ice sheet. The particle size distribution of the sediment varied greatly and ranged from clay particles to large boulders. This material has been labelled glacial till or boulder clay and is the most widespread soil type in Ireland. If conditions were suitable, sediment was also deposited as distinct bands of sand, gravel, silt and clay. Glacial till can range in thickness from less than 1m thick to tens of metres in depth.

The study area was glaciated on at least two occasions but the majority of the sediments present today are as a result of the last glaciation, which was at its maximum some 24,000 years ago.

The EPA soil mapping indicates that the soils comprise primarily of Grey Brown Podzolics and Brown Earths (BminDW). The soil mapping for the site is presented in Figure 6.2 overleaf. The Teagasc Soil Map of Ireland as presented on the GSI website shows the soil in the area to be predominantly gleys and brown earths derived from limestone glacial till which is to be expected, given the underlying bedrock. The site is shown to be underlain by Made Ground (See Figure 6.3).

The geological sequence underlying the site is expected to be as follows:

- *Hardstanding*
- *Topsoil (possibly)*
- *Made Ground (possibly)*
- *Glacial Tills*
- *Limestones and Mudstone*

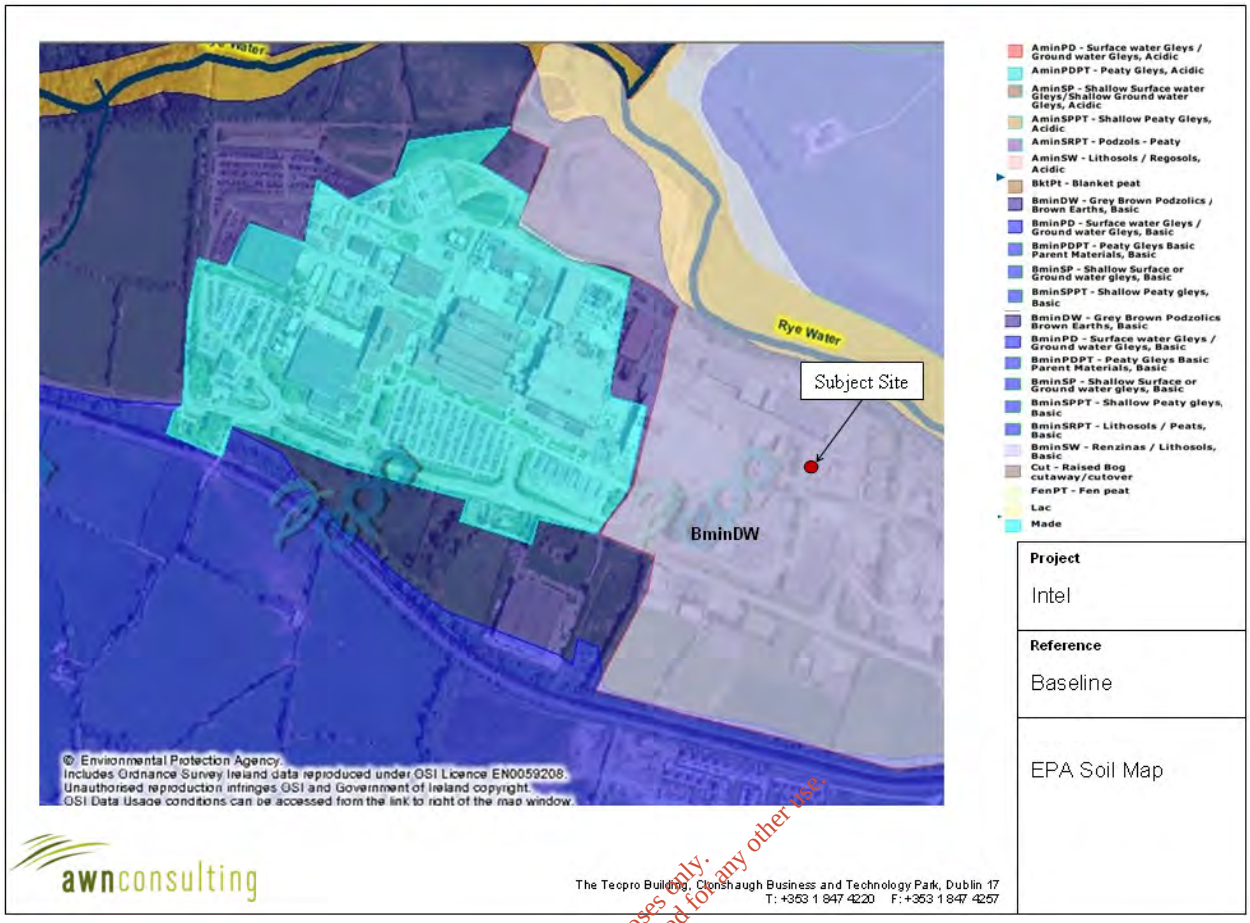


Figure 6.2 EPA Soil Map

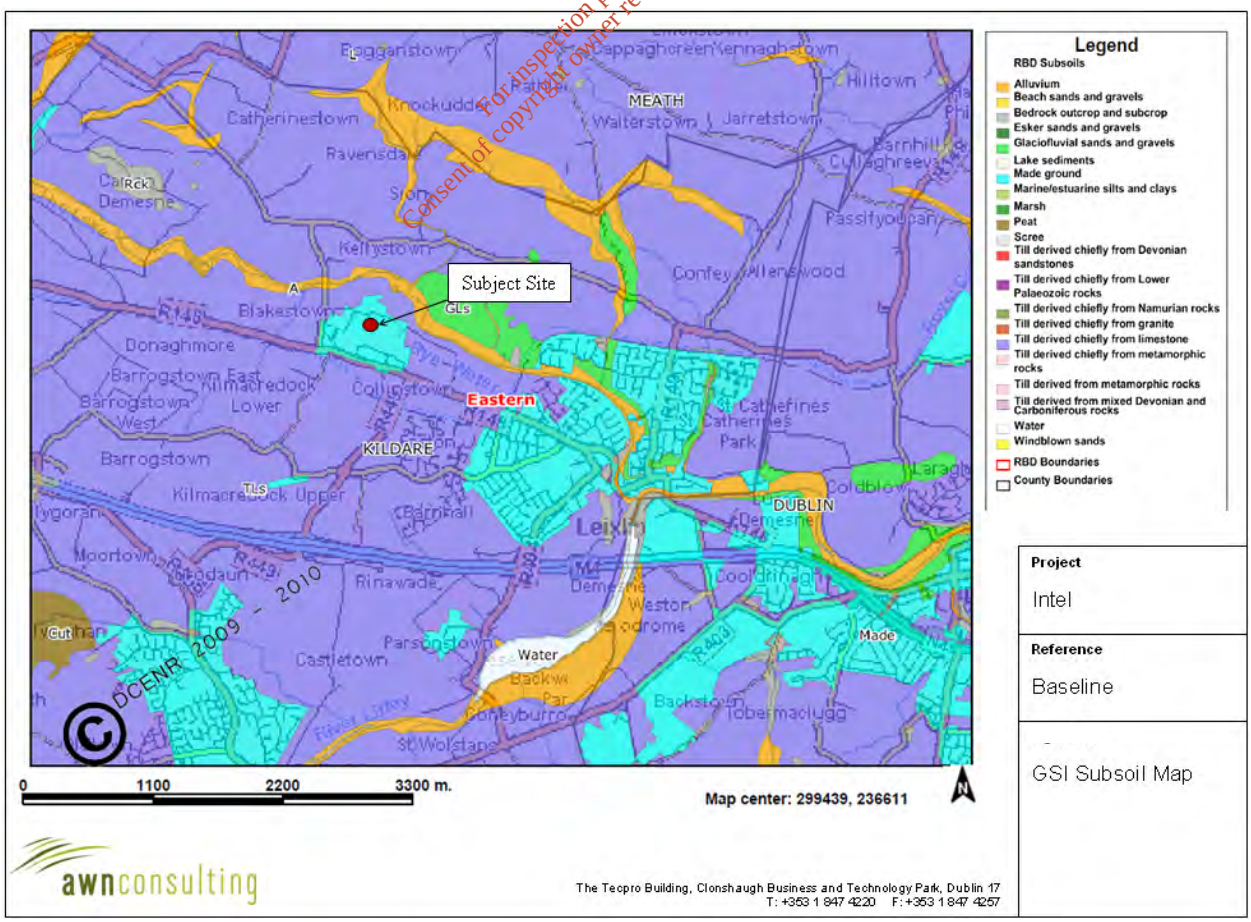


Figure 6.3 Teagasc Soil Map

6.3.3 SOILS

The soils distribution across the study area is provided on the EPA/Teagasc Soils Map. The map identified gleys and brown earths as the distinct soil types that exist in the general area.

Gleys

Gleys are soils in which the effects of drainage impedance dominate and which have developed under the influence of permanent or intermittent waterlogging. The impedance may be due to a high water table, to a 'perched' water table caused by the impervious nature of the soil itself, or to seepage of runoff from slopes. Most gleys have poor physical conditions, which make them unsuitable for cultivation or for intensive grassland farming. Their productive capacity is also affected by restricted growth in spring and autumn.

Brown Earths

These are relatively mature, well-drained, mineral soils possessing a rather uniform profile that have not been extensively leached or degraded. Brown Earths possess medium soil texture and have good structure and drainage characteristics and are extensively cultivated. They have relatively low nutrient status.

Figure 6.3 shows the general soil type for the study area. The EPA/Teagasc has defined the soil type as till derived chiefly from Limestone.

6.3.4 SITE HISTORY AND HISTORICAL SPILLAGES

Current and previous site uses – no info available as yet

There have been no incidents from on-site activities at the wider Intel site that have caused a known off-site ground or groundwater contamination. Five historical incidents have occurred at the Intel site, none of which are expected to have impacted on the ground at the proposed construction area.

Two of the incidents occurred at the FAB 24 area. A sodium hydroxide (NaOH) spill occurred in 2003 when a 25% sodium hydroxide solution overflowed from a day tank bund located between the FAB 14 and FAB 24 buildings. A spill of 5 litres occurred at the FAB 24 Bridge Caustic Day Tank Containment Breach in 2009. The leak was detected on a high level valve from the sodium hydroxide (caustic) pump recirculation line to the bridge scrubbers.

The other three incidents consist of a diesel spill at FAB 14 in 1997, and two foul sewer overflows in 2005 and 2006.

6.3.5 SITE INVESTIGATIONS

Borehole logs are available for 26 monitoring wells, which were installed by rotary drilling at the subject site. Monitoring wells MW1 to MW19 were installed in 1994 by S. Kelly & Sons and monitoring wells MW22 to MW28 were installed in 2003 by ESI. The inspection of borehole logs confirms the presence of limestone bedrock beneath the subject site. The grey limestone encountered on the subject site was noted in the borehole logs to be dense and hard in nature and included interbedded black argillaceous limestones.

The closest borehole to the subject site is MW16. This borehole extends to a depth of 16m BGL. Limestone bedrock was encountered borehole MW16 within 11.2m of the ground surface.

Ground conditions encountered during drilling MW16 are summarised as follows:

- Topsoil (0 – 0.5)
- Sandy pebbly Silt (0.5 – 4.2)
- Fine grained Limestone (4.2 – 11.2)
- Interbedded Limestone and shales (11.2 – 16)

A groundwater strike was recorded in the limestone bedrock at 12m BGL in borehole MW16.

6.3.6 AQUIFER CLASSIFICATION

Reference to the GSI National Draft Bedrock Aquifer Map for the subject site (see Figure 6.4) indicates that the site is underlain by a Locally Important Bedrock Aquifer (LI), which is described by the GSI as bedrock that is moderately productive only in local zones. The primary characteristic of the bedrock aquifer beneath the subject site is groundwater flow via fissure permeability. This classification refers to the Calp Limestone bedrock.

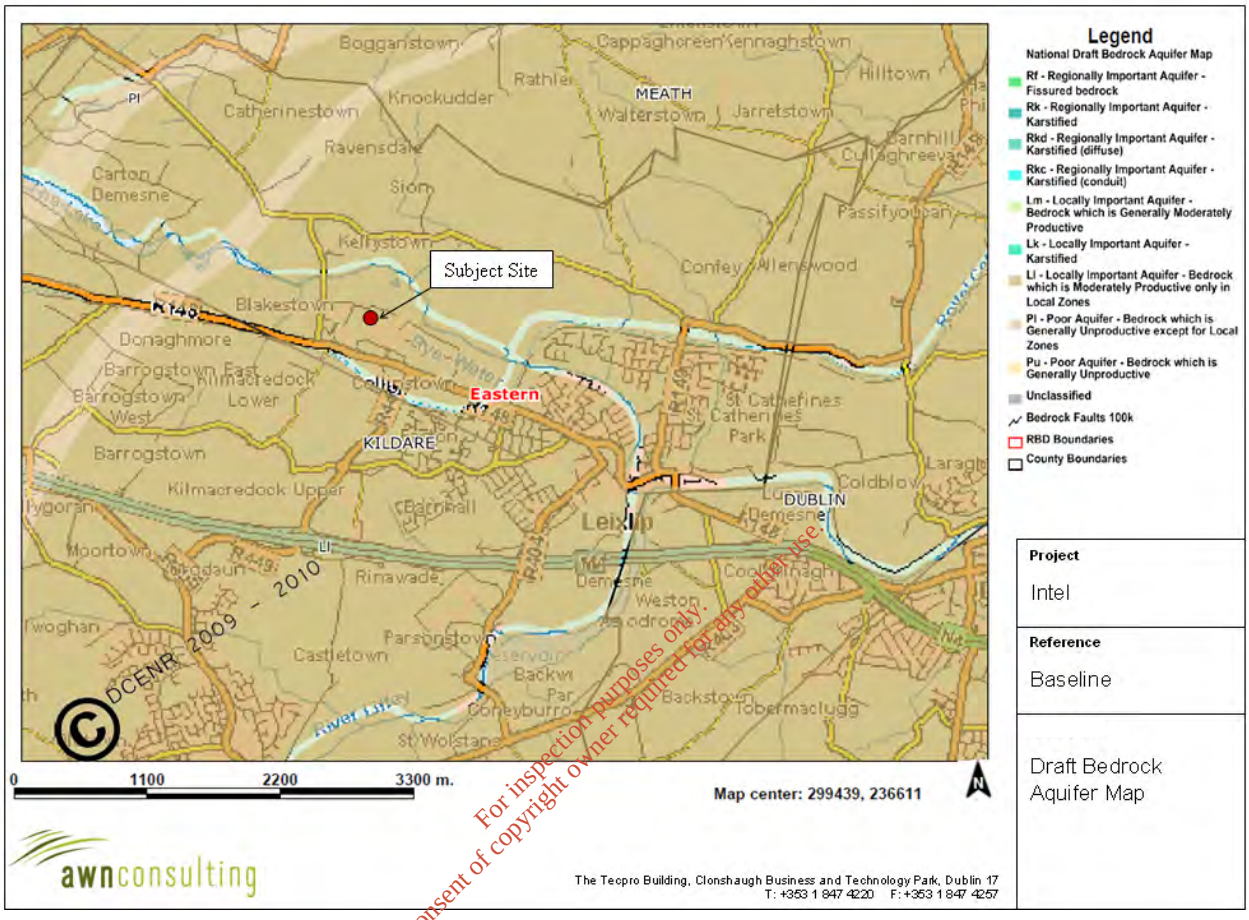


Figure 6.4 GSI National Draft Bedrock Aquifer Map

Karstic features are not indicated by the GSI at the subject site but are present in its vicinity. Karstic caves are recorded by the GSI along the Rye Water River in the townland of Blakestown (approximately 1km to the northwest of the site) and karst is recorded in the townland of St. Catherines (approximately 2km to the southeast of the subject site).

6.3.7 GROUNDWATER QUALITY

Nineteen of the groundwater monitoring wells have been sampled and analysed as required under the conditions of the existing IPPC licence (Register P0207-03). Many of the monitoring wells have been positioned down hydraulic gradient of potential contaminative site sources. The intrusive investigation was used to determine the baseline quality of the site and also to assess whether site processes have impacted the underlying ground. The monitoring wells provide the basis for on-going sampling and are sampled each year for a full analytical suite.

Data obtained from on-site groundwater monitoring wells indicates that groundwater beneath the site flows in an approximate north/north-easterly direction towards the Rye Water which forms a discharge boundary to the north of the site. The deeper regional position may be controlled by discharge to the River Liffey and the coast at Dublin Bay.

The groundwater monitoring results are consistent from one sampling event to another with water quality being reported as being free of industrial contamination.

A summary of the most recent groundwater monitoring results carried out during 2010 is presented below in Table 6.1 below.

Parameter	Units	Feb '10 (Min)	Feb '10 (Max)	Aug '10 (Min)	Aug '10 (Max)
Water Level	m btoc	0.5 (MW8)	10.15 (MW5)	0.59 (MW8)	10.47 (MW5)
pH	-	7.1 (MW13)	7.70 (MW2	6.51 (MW2)	7.44 (MW19)
Conductivity	µS/cm	346 (MW18)	1365 (MW4)	632 (MW18)	1410 (MW16)
COD	mg/l O_2	5 (Multiple)	66 (MW11)	<5 (Multiple)	1485 (MW18)
Nitrate	mg/l NO_3	1(MW15)	26 (MW20)	<1 (Multiple)	16.9 (MW4)
Total Ammonia	mg/l (as N)	0.0196 (MW12	1.65 (MW7)	<0.01 (Multiple)	0.0731 (MW5)
Total Ammonia	mg/l (as NH4)	0.025 (MW12)	2.13 (MW7)	<0.013 (Multiple)	0.094 (MW5)
Total Nitrogen	mg/l N	1.8 (MW2)	7.7 (MW20)	1.2 (Multiple)	3.8 (MW4)
Total Oxidised N	mg/l N	0.0196 (MW 12)	5.9 (MW20	<0.7 (Multiple)	3.8 (MW5)
Chloride	mg/l Cl	1 (MW9)	205 (MW14)	24 (MW18)	202 (MW14)
Fluoride	mg/l F	0.016 (MW8)	0.86 (MW5)	<0.22 (Multiple)	0.68 (MW5)
Nitrite	mg/l N	0.0198 (MW5)	0.1287 (MW14)	<0.0165 (Multiple)	0.0198 (MW13)

NOTES

1. mbtoc = metres below top of column
2. '<' denotes a result which is less than the Limit of Detection (LOD)
3. Multiple denotes result found at multiple wells between MW1 - MW20

Table 6.1 Groundwater Monitoring Results 2010

Information from the GSI8 indicates that aquifers in Co. Kildare mainly contain calcium magnesium bicarbonate type waters with Total Dissolved Solids of less than 500mg/l. The Total Hardness (as CaCO3) ranges from 300mg/l to 400mg/l.

6.3.8 AQUIFER VULNERABILITY

Reference to the GSI Interim Vulnerability Groundwater Map (see Figure 6.5) indicates that the vulnerability of the bedrock aquifer beneath the subject site has been classed as high.

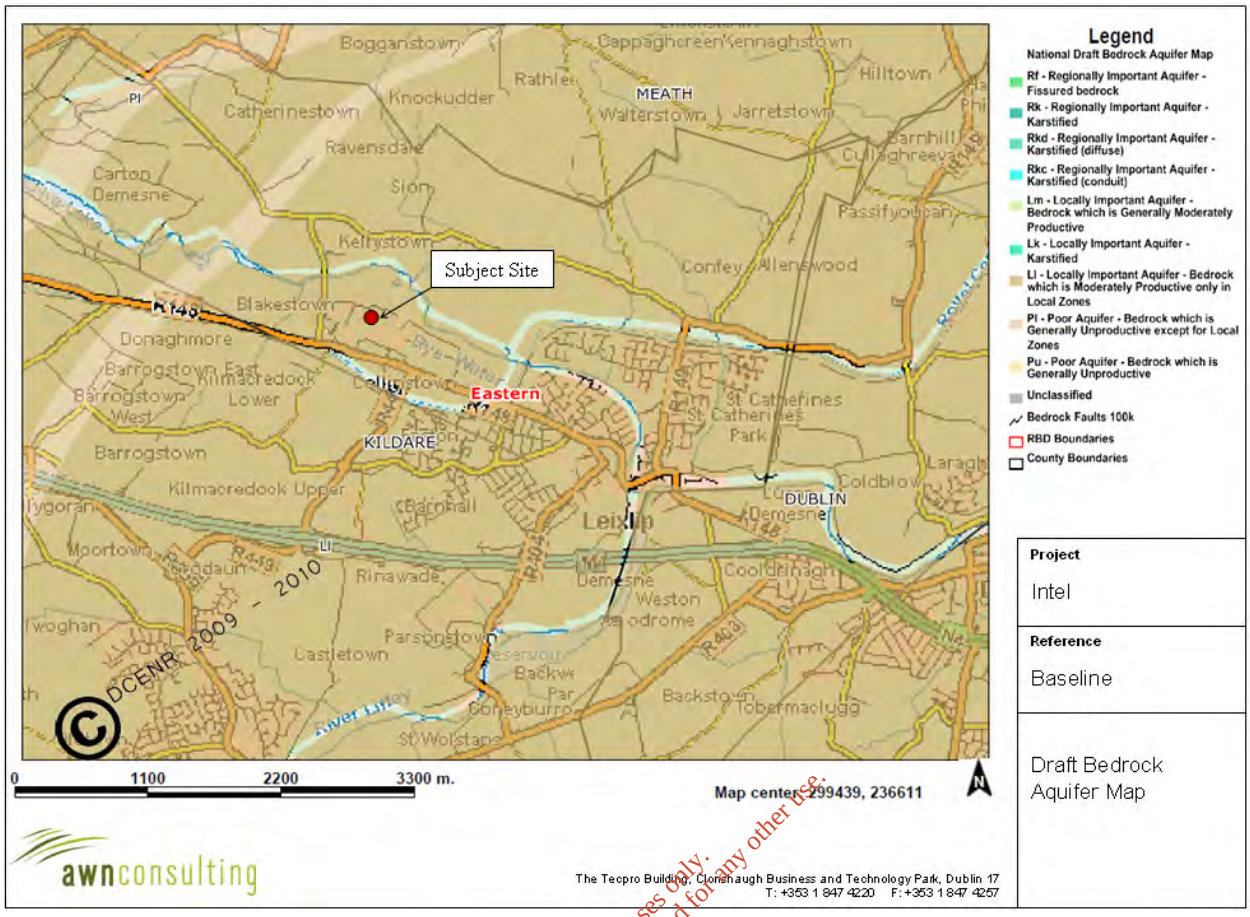


Figure 6.5 GSI Interim Vulnerability Groundwater Map

This indicates the presence of between 3m and 10m of moderately permeable subsoils overlying the bedrock aquifer, as shown in Table 6.2. It is noted that the bedrock at nearby borehole MW16 records 11.2m of overburden.

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

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

Table 6.2 Vulnerability Mapping Guidelines

The GSI groundwater database indicates that there is no groundwater source protection zone in the vicinity of the site.

6.3.9 GROUNDWATER YIELD

Information from the GSI indicates that fissure permeability (via cracks, joints and faults) dominates in the bedrock aquifers in the Co. Kildare and Co. Wicklow. Reasonably large water supplies have been developed in boreholes (ranging from 50m to 100m deep) and groundwater yields in excess of 200m3/day have been recorded along faults in the bedrock in Co. Kildare & Co. Wicklow.

The Calp Limestone, which is the bedrock type present beneath the subject site, is variable but tends to be dominated by low permeability, fine grained and argillaceous limestones and shales. It is generally unproductive in terms of groundwater yields. However, more permeable strata are located within this geological unit, which provide higher groundwater yields. In the Dublin area, many of the high yielding wells appear to have penetrated substantial faults, fractures or fissures in the Calp bedrock. Groundwater yields of between 40m3/day to 1000m3/day have been recorded in certain clean limestones and higher permeability horizons in Calp Limestone in the Dublin area.

The Groundwater Protection Scheme for Co. Meath indicates that basal Calp tends to have a higher groundwater yield than the upper layers of this bedrock type. This is because the basal Calp consists of coarser grained limestones and contains less shale than the upper layers of the rock, which improves permeability within the rock.

6.3.10 LEIXLIP SPA

An unusual feature of the groundwater regime in Co. Kildare is the formation of warm springs that occur in a syncline in the Lucan-Celbridge area.

The Leixlip Spa is considered a hydrogeological feature of particular importance in the vicinity of the subject site and is located to the immediate east of the Intel facility.

Leixlip Spa forms part of a seam of hot springs that extend from Co. Kildare to Co. Meath according to Kildare County Council. Warm springs occur in a syncline in the Lucan-Celbridge area, which allows warmer water to the surface. The Leixlip Spa is located close to the Celbridge Syncline.

The Leixlip Spa comprises a wetland area, which has developed on five distinct terraces on shallow bedrock. A complex groundwater system is understood to be present at Leixlip Spa and comprises the following, which is supported by the different hydrochemical signatures of the groundwater:

- A deeper, older, warmer groundwater system, which discharges to the spa well. The groundwater is highly mineralized and iron rich. This groundwater system is considered the main source of groundwater at the spa;
- A more recent, shallow groundwater system that flows through conduits in the karstified limestone bedrock and discharges near the filtering ponds at the spa. Groundwater from the shallow system discharges near rock faces and there is understood to be lateral flow toward the River Rye; and
- Deeper older groundwater that flows through a younger groundwater system and mixes with it.

Groundwater flow in the shallow groundwater system at Leixlip Spa is largely through conduits in the karstified bedrock. This indicates that karstified bedrock may be present beneath the Intel facility. However, the presence of notable rock cavities were not evident in the borehole logs for the Intel facility and recent rotary drilling which included obtaining rock cores did not indicate the present of karstified rock.

Due to the proximity of the Leixlip Spa to the subject site, it is also likely that the Intel facility may be underlain by complex groundwater systems. Monitoring well MW14, which is located on the eastern boundary of the Intel facility, shows five to seven times higher chloride levels than wells MW13 and MW15, in addition to higher concentrations for electrical conductivity. This indicates that well MW14 at the Intel facility may be influenced to some extent by the same deeper, older groundwater system at the Leixlip Spa.

Chalybeate spring is situated near Louisa Bridge, located approximately 1km to the south east of the Intel facility. The warm water (16-17oC) emerges from along the edge of the Royal Canal. The spring was reportedly discovered in 1793 during canal excavations. Similar warm springs have not been noted along Rye Water and the local topography does not appear to influence location.

6.3.11 GROUNDWATER WELLS

The GSI Well Card Data search included the town of Leixlip, in addition to the nearest townlands to the Intel facility (including Kellystown, Sion, Blakestown, Donaghmore, Barrogstown East, Barrogstown west, Kilmacredock Lower, Easton and Barnhill).

The wells recorded by the GSI in the area surrounding the site were installed into the underlying bedrock at depths in the range of 3.0m to 79.2m below ground level (BGL). The groundwater yield from these wells ranged from poor to moderate with recorded yields from as little as 5.4m3/day in a well drilled to 39m BGL in Collinstown up to 88m3/day in a well drilled to 23.2m BGL in Leixlip. The groundwater yields recorded by the GSI in the townland of Collinstown, where the subject site is located, range from poor at 5.4m3/day to moderate at 87.3m3/day.

The GSI Well Card Data also indicates the presence of a spring at Kilmacredock Lower, which is located to the southeast of the site, but no information is provided on its usage. Details on the usage of the wells were not provided in the GSI Well Card Database.

The overall direction of groundwater flow beneath the subject site is expected to be in a northerly or northeasterly direction towards the Rye River, which is the main surface water body in the immediate vicinity of the subject site. The regional direction of groundwater flow is likely to be influenced by the River Liffey, which is located approximately 1.5km to the southeast from the subject site.

6.3.12 WATER FRAMEWORK DIRECTIVE

The subject site is located in the Eastern River Basin District. According to the River Basin Management Plan for the ERBD (2009 to 2015), groundwater beneath the subject site is classed as “at risk” of not achieving good status by 2015 under the WFD. This indicates that the groundwater beneath the subject site and in the surrounding area is not considered to be of high quality. Therefore, the groundwater quality beneath the subject site must be protected and improved in order to achieve the objectives of the Water Framework Directive by 2015. Map 6.3 in the ERBD River Basin Management Plan indicates that the overall objective for groundwater quality in the Leixlip area is protection under the WFD.

6.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed FAB 24C development will consist of an extension to the FAB 24 building and a number of other smaller works adjacent to existing buildings on the FAB 24 site. The construction phase of the proposed building will involve the removal of existing concrete yard areas and the disturbance and removal of some topsoil and subsoil. Excavations will not impact on bedrock and no dewatering requirement is envisaged. Concrete pad foundations will be used during construction.

6.5 POTENTIAL IMPACTS

The potential impacts of the construction and operational phases of the proposed development on the soil, geological and hydrogeological environment are outlined in the following paragraphs.

6.5.1 CONSTRUCTION PHASE

Soil Removal and Compaction

Removal of existing concrete at the site will be required. Soil stripping and subsoil removal will also be required during the construction of the pad foundations which may impact on the vulnerability rating of the bedrock. Compaction of soils may also occur during the construction phase due to vehicle movement across the site. There is no evidence that historical spillages have occurred at the site. However, unexpected contamination may be encountered during the excavation works. Any disturbance of contamination material could cause mobilisation and migration of contaminations and impact underlying groundwater.

Excess excavated soil will need to be appropriately classified for off-site use or disposal at a suitably licensed landfill.

Accidental Spills and Leaks
During construction of the development, there is a risk of accidental pollution incidences from the following sources:

- Spillage or leakage of oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.
- The use of concrete and cement during pad foundations.

Accidental spillages may result in contamination of soils and groundwater underlying the site, should contaminants migrate through the subsoils and impact underlying groundwater. Soil stripping and pad foundation construction will also reduce the thickness of subsoils.

Concrete (specifically, the cement component) is highly alkaline and any spillage which migrates though subsoils would be detrimental to groundwater quality.

Surface Water Runoff
Surface water runoff during the construction phase may contain increased silt levels or become polluted from construction activities. Runoff containing large amounts of silt can cause damage to groundwater underlying the site. Silt water can arise from exposed ground and soil stockpiles (prior to reinstatement).

In relation to the construction phase the potential impact on the soils, geology and hydrogeology is considered to be slight. This is because excavations and dewatering in the bedrock will not be required, however some subsoils removal will be required and groundwater vulnerability at the site is currently classified as high.

6.5.2 OPERATIONAL PHASE

There will be no direct discharges to the water or soil environment during the operational phase.

There is a potential for leaks and spillages during operation and maintenance of the development. Any accidental emissions of chemicals or oil, petrol or diesel leaks could cause contamination if the emissions enter the soil and groundwater environment.

In relation to the operational phase the potential impact on the soils, geology and hydrogeology is considered to be **slight**.

6.6 REMEDIAL AND MITIGATION MEASURES

In order to minimise the potential impacts from the development, the following mitigation measures will be implemented to ensure that contamination of soils and groundwater does not occur.

6.6.1 CONSTRUCTION PHASE

Soil Removal and Compaction
Construction works will be carried out in such a manner as to ensure the least feasible disturbance of soils and subsoils. Existing concrete hardstanding will be removed and hardstanding will be reinstated following the works. Soils and subsoils removal will be necessary where concrete pad foundations are required. Ground conditions at nearby borehole MW16 records 11.2m of overburden. Therefore, the vulnerability rating of the bedrock is unlikely to change from high to extreme as a vulnerability rating of extreme would indicate only 3m of subsoil cover.

Contractors will be required to submit and adhere to a method statement indicating the extent of areas likely to be affected and demonstrating that this is the minimum disturbance necessary to achieve the required works. Where concrete removal and soil stripping occurs the resulting excavated material will be separated into concrete, topsoil (if present), made ground/fill (if present) and subsoil stockpiles.

It is envisaged that any topsoil encountered will be retained on site where possible and reused as fill material (if suitable). Some of the subsoil excavated will be, where possible, retained for use on site.

Temporary storage of spoil will be carefully managed in such a way as to prevent any potential negative impact on the receiving environment and the material will be stored away from any surface water drains.

Although there is no evidence of spillages in the area, all excavated materials will be visually assessed for signs of possible contamination such as staining or strong odours. Should any unusual staining or odour be noticed, samples of this soil will be analysed for the presence of possible contaminants in order to ensure that historical pollution of the soil has not occurred. Should it be determined that any of the soil excavated is contaminated, this will be dealt with appropriately as per the Waste Management Act of 1996 and associated regulations.

In the event of soils being taken off site, the soils will be removed and disposed of by contractors licensed under the Waste Management Act of 1996 (as amended 2001), the Waste Management (Facility Permit & Registration) Regulations of 2007 and the Waste Management (Collection Permit) Regulations of 2007. The issuing of such a permit to contractors allows them to use such material for landscaping and land reclamation, subject to conditions defined in the permit if the material has been classified as suitable for this use. Otherwise, the material will be classified for disposal at a suitably licensed landfill and removed off-site by a licensed waste contractor. In terms of surplus soil, any residuals will be stored within appropriate storage areas of sufficient capacity prior to removal by a suitably licensed waste management contractor for off-site treatment/recycling/disposal.

A construction and demolition waste management plan will be developed in accordance with the Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (DoEHLG, 2006) to ensure that all construction waste is stored, managed, moved, reused or disposed of in an appropriate manner by appropriate contractors in accordance with all relevant waste legislation.

Accidental Spills and Leaks

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents and paints used during construction will be stored within temporary bunded areas. Oil and fuel storage tanks shall be stored in designated areas, and these areas shall be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) shall be diverted for collection and safe disposal.

Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area (where possible) of the site, which will be away from surface water gulleys or drains. In the event of a machine requiring refuelling outside of this area, fuel will be transported in a mobile double skinned tank. An adequate supply of spill kits and hydrocarbon adsorbent packs will be stored in this area. All relevant personnel will be fully trained in the use of this equipment. Guidelines such as “Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors” (CIRIA 532, 2001)7 will be referred to.

Concrete will be mixed off–site and imported to the site. The pouring of concrete will take place within a designated area using a geosynthetic material to prevent concrete runoff into the soil/groundwater media. Wash down and washout of concrete transporting vehicles will take place at an appropriate facility offsite.

Surface Water Runoff

Water containing silt will be treated to ensure silt removal and then disposed of to the foul sewer. Further details on the surface water collection systems on site are presented below.

Environmental Management System

During the construction phase, all works will be subject to Intel’s environmental management system. A variety of best available techniques are applied to ensure a high standard of environmental protection is provided during the operational lifetime of the Intel Ireland plant. The measures focus on preventing residuals from initially being generated and having control measures in place for any accidental emissions.

A comprehensive environmental management system operates to ensure staff onsite are suitably trained and know how to both prevent releases from occurring and what to do in the event of a release. This includes defined procedures to ensure that chemicals are handled and stored correctly. By applying best available techniques and operating a comprehensive environmental management system in order to prevent chemical releases to the environment, potential residuals associated with water and land in particular are also minimised.

Measures in place to prevent environmental incidents or minimise their impact in the event of occurring are summarised below.

Systems are built into the design of the site to ensure that environmental media are not impacted in the event of a spillage or fire. This applies to all production areas of the site. The systems are based on the principal of segregating potentially contaminated surface waters and ensuring suitable storage and containment is present in the event of contaminated material being generated.

Double Contained Systems

All chemicals are stored in double contained or bunded areas with monitors in place to identify leaks in containment areas. Bunds storing chemicals are lined with chemical resistant coating and a certified engineer checks the integrity of the bunds as part of the conditions under the existing IPPC licence (Register P0207). Process tools that use hazardous chemicals are also held in contained areas.

Segregated Surface Water Systems

Two types of surface water collection systems are in place onsite. The uncontained surface water system takes surface water from areas of the plant where chemicals are not stored. These are discharged to the Rye Water via a retention pond. The contained surface water system serves areas where chemicals are used, stored or transferred with the exception of the western service road. The contained system allows surface water to be rerouted to either dedicated underground tanks in the service yard or the AWN of each FAB in the event of a chemical spill or fire. Contaminated waters are therefore prevented from reaching the Rye Water, ground or groundwater. Approved contractors check the integrity of the contained systems as required by existing IPPC licence conditions. These integrity checks are reported to the Environmental Protection Agency (EPA) within the AER.

Grit and Grease Traps and the Retention Pond

To ensure the quality of discharges to the Rye Water, all surface waters are discharged to the River through a retention pond having passed through grit and grease traps. The outlet of the retention pond can be closed in the event of a spill or fire.

Tank Overfill Alarms and Spill Aprons

To minimize the potential of overfilling any chemical-containing tanks, all tanks are fitted with high fill alarms connected to the FMS system. In the unlikely event of any overfill or spillage, this will be captured in the bunded areas. The transfer of material to road tanker for removal on-site is also carried out in spill aprons connected to the contained surface water system.

Management Systems and Training

A comprehensive environmental management system is in place to ensure staff are aware of how to prevent releases and is certified to the international standard ISO 14001. The management system includes documented procedures to ensure operational control of activities is maintained and best practice is carried out at all times.

Intel has also developed training programmes that are aimed at all staff levels within the organisation. The training packages include modules for best practice, general environmental awareness and emergency response.

Emergency Response

Trained members of the emergency response team (ERT) are available onsite 24 hours a day to coordinate and manage any environmental incident and to minimise the consequences should an incident occur. The effectiveness of the environmental management and containment systems in preventing uncontrolled releases to the environment is demonstrated in the low number of incidents that have occurred to date.

Implementation of the above remediation measures during the construction phase and the application of Intel's environmental plan to the construction works management plan will reduce the impact from slight-moderate to **imperceptible**.

6.6.2 OPERATIONAL PHASE

Accidental Spills and Leaks
Emissions from fuel spills or leaks or runoff from rainwater that has passed over the impermeable surfaces will be prevented from entering the soil and/or underlying groundwater as all surface water runoff from the development will be directed to liquid separators prior to discharge to the drainage system.

In order to minimise any impact on the underlying subsurface strata from material spillages, oil and fuel storage tanks will be stored in designated areas with an impervious base. These areas will be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) will be diverted for collection and safe disposal.

Environmental Management Plan
The site-wide mitigation measures and spill control programme in place at the Intel Ireland site which is implemented as part of the environmental management plan will apply to the development during the operational phase. A summary of the environmental measures is presented in the previous section.

Intel has implemented thorough environmental monitoring and chemical management procedures and consequently has had few contaminant releases to the environment. Ongoing groundwater monitoring has found no evidence of significant contamination, while a review of environmental incidents has found only two releases with the potential to have a residual impact on the soil, geology and hydrogeology environment since operations began. Each of these releases was investigated and the impacted areas were found to be localised. Neither of the releases are located in the vicinity of the proposed development. A Residual Management Plan assessment has been carried out and identified only minor residual soil or groundwater liability associated with previous environmental incidents. There is no threat of contamination of off-site receptors from these events.

Implementation of the above remediation measures during the operational phase and the application of Intel's environmental management plan to the operational phase will reduce the impact from slight to **imperceptible**.

6.7 RESIDUAL IMPACTS

The proposed development will have an **imperceptible** residual impact on the soils, geology and hydrogeology environment due to the implementation of the mitigation measures outlined in the previous sections and within Intel's environmental management plan. Accordingly there will be no negative impact (either short term, long term, direct or indirect) as a result of this proposed development on the surrounding soils, geology and hydrogeology environment.

7. WATER AND HYDROLOGY

7.1 INTRODUCTION

This chapter assesses the impacts on the water environment (surface water, waste water and water supply) arising from the proposed development (conversion) at FAB 24, Intel Ireland Ltd. The chapter has been prepared by AWN Consulting Limited.

This assessment was considered in the context of the available baseline environmental information; potential impacts; consultations with statutory bodies and other parties and other available relevant information. For the purpose of this chapter, each aspect (surface water, waste water and water supply) has been assessed separately.

7.1.1 METHODOLOGY

The assessment of the potential impact of the proposed development on the water environment was carried out according to the methodology specified in the following guidance documents:

- Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Statements (2002)[1]
- EPA Advice Notes on Current Practice (in the Preparation of EIS) (2003)[2].

The following sources of information were consulted:

- EPA water quality monitoring data for watercourses in the area[5];
- ERBD Management Plan – Rye Water Water Management Unit and Programme of Measures – ERBD[5]
- Office of Public Works flood mapping data (www.floodmaps.ie)[11];
- Requirements for the Protection of Fisheries (Eastern Regional Fisheries Board (ERFB))[6]
- The Planning System and Flood Risk Management[7]
- Greater Dublin Regional Code of Practice for Drainage Works: Version Draft 6.0[8]
- The Geological Survey of Ireland (GSI) well card and groundwater records[3];
- Control of Water Pollution from Construction Sites,[9]

In addition, the following reports and information provided by Intel were made available:

- Extracts from Intel Ireland IPPC Licence 2010 AER Report – surface water report

7.2 SURFACE WATER

This section has been prepared to identify and assess the impact of the proposed development on the surface water environment and introduce the relevant mitigation measures.

7.2.1 RECEIVING ENVIRONMENT

Intel Ireland Ltd. is located within the Eastern River Basin District (ERBD) in Hydrometric Area No. 09 of the Irish River Network. It is within the River Liffey catchment and is adjacent to the River Rye (Rye Water).

The Rye Water bounds the Intel Campus to the north, the Royal Canal is situated to the south of the Intel Campus and a retention pond which is part of the Intel Campus surface water management system is situated to the north west of the proposed development site.

Only clean surface water run-off from the Intel site is discharged to the Rye Water. Wastewater from the Intel site is discharged to the Leixlip Municipal Waste Water Treatment Plant (MWWTP), which in turn discharges to the River Liffey.

The Rye Water River rises in southern Co. Meath and enters the River Liffey at Leixlip. The catchment of the Rye Water is relatively flat and is approximately 215km² in area to Leixlip Bridge. The Rye Water flows in a south-easterly direction and passes close to the towns of Kilcock and Maynooth and through the Carton House demesne. The Rye Water is a tributary of the River Liffey. The Leixlip dam, which is used for the generation of electricity, is situated upstream of the Rye Water and River Liffey. The site is located within the Lower catchment area of the Liffey. See Figure 7.1 for the hydrological environment of the Intel Campus, Leixlip and the surrounding area.

The River Liffey catchment encompasses an area of approximately 1,369km^2. The river extends from the mountains of Kippure and Tonduff in County Wicklow to the sea at Dublin Bay. The main channel covers a distance of approximately 120km and numerous tributaries enter along its course. The river also passes through Blessington Lakes that were constructed in 1940 to provide a water supply and source of power for Dublin. Pollaphouca and Golden Falls Dams control the lake water levels and are a source of hydroelectric power. The dam was constructed at Leixlip in 1949. The construction of dams along the watercourse has enabled the flow rate of water to be controlled.

7.2.1.1 WATER QUALITY CONTEXT

The proposed development is located within the ERBD, as defined under the EU Water Framework Directive (2000/60/EC), establishing a framework for community action in the field of water policy, (commonly known as the Water Framework Directive [WFD]).

The WFD requires 'Good Water Status' for all European waters by 2015, to be achieved through a system of river basin management planning and extensive monitoring. 'Good status' means both 'good ecological status' and 'good chemical status'. In 2009, the ERBD River Management Plan (RMP) 2009-2015 was published. In the ERB RMP the impacts of a range of pressures were assessed including diffuse and point pollution, water abstraction and morphological pressures (e.g. water regulation structures). The purpose of this exercise was to identify water bodies at risk of failing to meet the objectives of the WFD by 2015 and include a programme of measures to address and alleviate these pressures by 2015.

Each river catchment within the ERBD was assessed and a water management plan detailing the programme of measures was put in place for each.

The current status of the lower reaches of the Rye Water (Rye Water Lower) is "Bad". The WFD recognises that in some cases it may not be possible to achieve all core objectives by 2015. For the Rye Water WMU (Water Management Unit), the main pressure preventing achievement of Good Status is diffuse agricultural pollution. Full implementation of the measures is expected to correct this; however it is estimated that the Rye Water at the proposed development location (Rye Water Lower) will not achieve Good Status until 2027.

Table 7.1 shows the current status of the rivers monitored in the study area as part of the WFD monitoring program.

Water Bodies in WMU	Current WFD Status	Achieve Good Status by
Rye Water tributary, Porterstown	Bad	2027
Lyreen tributary, Clonshanbo	Bad	2021
Rye Water tributary, Kellystown	Bad	2027
Rye Water Upper	Bad	2027
Rye Water Lower	Bad	2027
Rye Water tributary, Carton	Bad	2027
Rye Water tributary, Lyreen Upper	Bad	2021
Rye Water tributary, Lyreen Lower	Moderate	2021
Rye Water tributary, Brides	Poor	2021

Table 7.1 WFD Status of Rivers within the Study Area

The EPA has been monitoring the water quality of the Rye Water and the Liffey for approximately 20 years. The most recent biological water quality data available is for the period 2005 to 2007. The results of the biological water quality monitoring at the EPA water quality monitoring locations is provided in Table 7.2 and the legends to explain the Biological Rating System are provided in Table 7.3.

Sampling Stations		River	Biological Quality Ratings (Q Values)					
EPA No.	Location		1988	1996	1998	2002	2005	2007
09R010500	Sandford's Bridge	Rye Water	3-4	3	3	3/4	-	-
09R010600	Bridge in Leixlip	Rye Water	3-4	3	3	3	3/0	3
09L011900	Leixlip Bridge	Liffey	3-4	3-4	-	3	3-4	3

Table 7.2 EPA Q Ratings for the Rye Water and Liffey (1988 – 2007)

Quality Ratings	Quality Class	Pollution Status	Condition
Q5, Q4-5, Q4	Class A	Unpolluted	Satisfactory
Q3-4	Class B	Slightly Polluted	Unsatisfactory
Q3, Q2-3	Class C	Moderately Polluted	Unsatisfactory
Q2, Q1-2, Q1	Class D	Seriously Polluted	Unsatisfactory

Table 7.3 EPA Biological Rating System

As can be seen from the monitoring data in Table 7.2, the Rye Water was classified as moderately polluted during each monitoring period from 1996 to 2007. The most recent data available is for 2007 and it shows that the biological quality rating was Q3 at the sampling station.

As part of the IPPC Annual Environmental Report requirements for the EPA, Intel Ireland carries out an annual survey of the Rye Water River water quality at various locations both upstream and downstream of the Intel site. The results of water samples collected in 2010 and 2011 (including August 2011 - latest monitoring event available) are provided in Appendices 7.1 and 7.2. Results obtained were compared with the European Communities "Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. No. 272 of 2009)", the European Communities "Quality of Surface Water Intended for the Abstraction of Drinking Water Regulations, 1989 (S.I. No. 294 of 1989)" and the European Communities "Quality of Salmonid Waters Regulations, 1988 (S.I. No. 293 of 1988)".

Appendices 7.1 and 7.2 show that the surface water samples taken from the River Rye, both upstream and downstream of the Intel facility, are of good quality; and there are no exceedences of the legislative limits for any of the parameters measured. The surface water monitoring report states that there does not appear to be a deterioration of water quality downstream of the Intel Ireland Ltd. site, indicating that the surface water discharges from this site are not resulting in significant environmental impacts on the receiving waters.

A limological survey of the Rye Water has been carried out every year since 1994 prior. The survey consists of a physical, chemical and biological assessment of the river undertaken by University College Dublin on behalf of Intel.

In relation to the proposed development the significant locations are the following:

- Site 5-Sandford's Bridge;
- Site 7-Stoneland Bridge; and
- Site 8-Upstream of the Aqueduct

Sampling Location	Biological Quality Ratings (Q Values)		
	2009	2010	2011
Sandford's Bridge	3	3-4	3-4
Stoneland Bridge	3-4	3-4	3-4
Upstream of the Aqueduct	3	3-4	3-4

Table 7.4 Limological Survey Results 2009-2011

The results of the 2011 and 2010 survey were identical. Both surveys showed that surface water discharge from the Intel site has had no detrimental impact on the fish stocks of the Rye Water. Salmonid densities have increased at the majority of sites, and little change has occurred to the macro invertebrate composition. The findings of the survey confirmed that the surface water discharge from Intel has had no deleterious impact on the biotic status of the Rye Water.

Water quality improved at some sites compared to that reported for 2009. Sites 5 and 8 both increased from a Q3 to a Q3-4 rating due to the presence of the more pollution sensitive taxa (Group A). Site 7 was rated Q3-4 as in 2009. The conclusions of the 2010 report stated that "It is encouraging to see most sites either improved or maintained a Q3-4 rating. Further improvement is required to achieve the minimum of 'good status' (Q4) required by the Water Framework Directive".

7.2.1.2 ON-SITE SURFACE WATER DRAINAGE

All surface water collected from the Intel Campus is discharged via an appropriately designed collection and retention system to the Rye Water. Discharges of surface water from the Intel site occurs from the collection of rainwater on impervious surfaces such as roof areas, roads and areas of hard standing. The surface water drainage system consists of a number of independent drainage routes from the roofs, paved areas and sub-drainage systems. These systems combine prior to entering a retention pond located on site and discharge via a single outlet pipe to the Rye Water.

The retention pond has an automated sluice gate to control release rates to the Rye Water and provide additional water quality protection in the event of accident or fire. The retention pond in combination with the natural flow rate attenuation effect of interceptor pits and drains prevents the sudden discharge of water in the Rye Water and prevent flow rates of the Rye Water being significantly increased.

Under normal operating conditions, the retention pond acts as an attenuation pond reducing peak flows to the Rye Water and also allowing any silt or grit to settle prior to the discharge to the River. In the event of a fire or spill on site, the pond inlet/outlet may be closed and storm systems diverted individually around the retention pond so that the pond's full storage volume may be utilised to contain potentially contaminated surface run-off.

Surface water from areas where hazardous chemicals are either transported, handled, used or stored are collected within the site's Contained Storm Sewer (CSS). In the event of a spill or fire event that can

generate potentially contaminated firewater, the CSS for the area around any accidental release is closed to contain any material onsite. This effectively separates potentially contaminated water from uncontaminated streams and prevents its discharge into the Rye Water.

Runoff water will continue to be drained to underground CSS tanks which will pass either to the site SS system for uncontaminated water or, be retained in the tanks or flow to the Acid Waste Neutralisation (AWN) pit for each FAB building in the event of any potentially contaminated storm water arising. The AWN pits provide very large retention capacity. FAB 24 AWN currently provides over 6,000m^3 of storage if required which far exceeds the volume of potentially contaminated flows for all accidental release scenarios.

Routing uncontaminated runoff waters away from the CSS system

Water from existing car parks and yard areas is drained via "Gullies" which act as grit and solids traps. The water is routed via the SS system isolated from areas drained by the CSS system. Runoff from the roof areas is similarly drained to these lines for clean runoff water.

The SS flow bypasses the CSS systems and joins the lines taking the water leaving the CSS system tanks to the site retention pond.

In the case of car parks and yard areas not used for chemical transport operations, runoff waters will continue to be managed as above including the presence of an interceptor on the SS line before it enters the retention pond and grit/grease traps to ensure that any possible contamination arising from the car parking areas does not enter the retention pond or the River Rye Water.

All site runoff waters ultimately pass to the site retention pond although uncontaminated streams can be diverted or bypassed around the pond in the event of a fire occurring at the same time as heavy rainfall. This allows the maximum volume of pond to be available to provide back-up containment to the CSS system and AWN pit storage should it be required. It also allows appropriate segregation of contaminated waters should they reach the retention pond from uncontaminated inflow of water to allow appropriate testing and treatment/removal of any contamination before discharge from the pond into the River is permitted to resume.

Collection of site runoff waters at site retention pond

The retention pond has an outlet fitted with an automated valve. When the valve is open, the outlet runs to the Rye Water and when shut, water accumulates in the pond allowing for analysis and review to ensure the water is uncontaminated before it is discharged to the river. Alternatively, retained water can be tankered away for appropriate treatment. On the inlet to the pond, a system of diversion chambers is in place. In the event of a spill or fire on site, this system can be operated in such a manner that only contaminated run off is routed to the pond, whilst uncontaminated runoff from other parts of the site bypass the pond and discharge directly to the river Rye Water. In this way, the contaminated water is isolated within the pond for subsequent analysis and appropriate disposal.

Analysis of Runoff Waters

The surface water discharge to the River Rye Water from the Intel site is monitored as part of the EPA IPPC licence requirements. Conductivity, Total Organic Carbon (TOC) and Chemical Oxygen Demand (COD) are monitored on a weekly basis and pH is continuously monitored. Heavy metals are monitored biannually. A summary of the results from 2009-2011 is shown in Table 7.5.

Parameter	Monitoring Frequency	Units	Average Emissions		
			2009	2010	2011
pH	Continuous	pH	8.0	7.9	Unavailable
Conductivity	Weekly	µS/cm	520.9	694.9	Unavailable
COD	Weekly	mg/l	<15.6	<17.9	Unavailable
TOC	Weekly	mg/l	<5.0	<5.4	Unavailable
Arsenic	Biannual	µg/L	<2	<2	2
Chromium	Biannual	µg/L	<2	<2	2
Cobalt	Biannual	µg/L	<2	<2	2
Copper	Biannual	µg/L	8.5	55	41
Nickel	Biannual	µg/L	<2	<2	<2
Tin	Biannual	µg/L	<2	<2	<2
Lead	Biannual	µg/L	<2	<2	<2

Table 7.5 Summary of Surface Water Emissions to Rye Water

7.2.1.3 FLOODING

In accordance with the guidelines produced by the Department of the Environment, Heritage and Local Government - The Planning System and Flood Risk Management Guidelines for Planning Authorities, November 2009 [1], a Stage 1 assessment was carried out. The Stage 1 Assessment is defined as Flood Risk Identification. The purpose of the assessment is to identify whether there may be any flooding or surface water management issues related to a plan area or proposed development site that may warrant further investigation.

The methodology used to prepare the flood risk identification (Stage 1) is outlined as follows

- Review of relevant Development Plans and Policies.
- Base map, rivers and lakes – Ordnance Survey of Ireland
- Geological Survey of Ireland (GSI) maps on superficial deposits (current and historical) [3]
- Flood points & Historical Floods – Office of Public Works (OPW) floods website [11]
- Extent of Flood Defences - OPW/Kildare County Council [13]

Relevant watercourses in the surrounding area were identified as part of the Stage 1 assessment. These were the River Rye (Rye Water), the River Liffey and the Royal Canal. Flood points along these watercourses are shown in Table 7.6.

Flood Location	Year(s) of Flood	Cause of Flooding
Rye Water, Kellystown Lane	2002	Rye water overflowed its banks due to insufficient bridge capacity. Road was flooded
Rye Water, Intel Campus	1993, 2000	Heavy Rainfall
Rye Water tributary, Shaughlins Glenn	2002	Surface water drainage pipe was broken. Road was flooded
Rye Water tributary, Confey Road	2002	Low lying land and road was flooded.
Rye Water, adjacent to Intel Campus.	2000	Heavy Rainfall
Rye Water, Leixlip Distillery	1954	Heavy Rainfall
Rye Water, Dúncarraig, Leixlip	2002	Rye Water overflowed its banks.
Rye Water, close to Leixlip Bridge	2008	Heavy Rainfall
Rye Water, Buckley's Lane, Leixlip	2002	Rye Water overflowed its banks.
Rye Water, at Leixlip Bridge	1954	Heavy Rainfall. Flood level at Leixlip Bridge - 103.45ft OD Poolbeg
River Liffey, Leixlip	1954, 1986, 2000, 2004	Heavy Rainfall

Table 7.6 OPW Flood Locations

Table 7.6 shows that significant flood events occurred in 1954, 1986, 2000, 2004 and 2008 in the Leixlip area. No flood events were recorded at the proposed development location within the Intel facility.

The River Liffey Flood Report 2000, carried out by ESBi in 2001 [7], stated that an analysis of flows indicated that the 2000 flood event has a return period in excess of 100 years, but relied on significant extrapolation of the rating. It is likely that this event has a return period in the order of 50 years or more. ESBi carried out a separate report on the 2000 and 2002 flood events in Leixlip, called the Leixlip Localised Flood Relief Study [16]. The report noted the following, in terms of historical flood data:

- Flood of November 2000 - The peak of the rainstorm occurred around 20:00 on 4/11/2000. The peak of the flow in the Rye Water generated from this storm, 82m³/s, occurred at 13:00 on 6/11/2000 approximately 36 hours later. In the case of the River Liffey, the peak discharge from Leixlip dam, 106m³/s, occurred a further 11 hours later at 24:00 hours on 6/11/00.

- Flood of November 2002 - The peak of the rainstorm occurred between 16:00 on 14/11/02 and 01:00 on 15/11/2002. Unlike 2000, there was an insignificant lag between the peak of the flow in the Rye Water generated from this storm, 88m³/s and the peak of the rainstorm. In the case of the River Liffey, the peak discharge from Leixlip dam, 82m³/s, occurred a further 13 hours later at 24:00 hours on 6/11/00.

In accordance with the recommendations highlighted in the above Study, a series of flood relief works were carried out on the Rye Water and the Shileachean River in Leixlip. The works were completed in 2009 and paid dividends as properties in Leixlip were not affected by flooding in November 2009.

In terms of the proposed development, the Stage 1 assessment has identified that the proposed development is located in Flood Zone C and no flood risks have been identified for the proposed development location therefore, in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities, there is no requirement to proceed to the Stage 2 assessment.

Storm water Discharge Volume Estimates

There will be no significant change in impermeable surfaces as a result of the proposed development and therefore no change to storm-water discharges from the Intel site.

7.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The impermeable surface area drained by the Existing FAB 24C is expected to remain essentially unchanged.

7.4 POTENTIAL IMPACT

The potential impacts of the construction and operational phases of the proposed development on the surface water environment are outlined in the following paragraphs.

7.4.1 CONSTRUCTION PHASE

Accidental Spills and Leaks
During construction of the proposed development, there is a risk of accidental pollution incidences from the following sources:

- Spillage or leakage of oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.

Accidental spillages may result in contamination of surface water, should contaminants migrate in the surface water runoff during the construction phase. Wet concrete (specifically, the cement component) is highly alkaline and any spillage would be detrimental to surface water quality.

Surface Water Runoff
Surface water runoff during the construction phase may contain increased silt levels or become polluted from construction activities. Runoff containing large amounts of silt can cause damage to groundwater underlying the site. Silt water can arise from exposed ground and soil stockpiles (prior to reinstatement).

Silty water will be appropriately managed and treated before discharge to ensure no environmental impacts occur. Silty will not be discharged to the foul sewer system, without appropriate treatment and approval by KCC of the standard to which it is to be treated.

In relation to the construction phase the potential impact on water is considered to be **slight.**

7.4.2 OPERATIONAL PHASE

There will be no direct discharges to the water environment during the operational phase.

There is a potential for leaks and spillages during operation and maintenance of the development. Any accidental emissions of chemicals or oil, petrol or diesel leaks could cause contamination if the emissions enter the soil and groundwater environment.

In relation to the operational phase the potential impact on the water is considered to be slight.

7.5 MITIGATION MEASURES

The following mitigation measures have been developed to mitigate the potential effects on the surface water environment. These measures seek to avoid or minimise potential effects in the main through the implementation of best practice construction methods and adherence to all relevant legislation.

7.5.1 CONSTRUCTION PHASE

Contractors will be required to submit and adhere to a method statement indicating the extent of areas likely to be affected and demonstrating that this is the minimum disturbance necessary to achieve the required works. Where concrete removal and soil stripping occurs, the resulting excavated material will be separated into concrete, topsoil and subsoil stockpiles.

Temporary storage of spoil and hardcore will be carefully managed in such a way as to prevent any potential negative impact on the receiving environment and the material will be stored away from any surface water drains.

Accidental Spills and Leaks

No bulk chemicals are to be stored in the construction area. Oil and fuel storage tanks shall be stored in designated areas, and these areas shall be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s), or 25% of the total volume, whichever is the larger (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) shall be diverted for collection and safe disposal.

Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area (where possible) of the site, which will be away from surface water gulleys or drains. In the event of a machine requiring refuelling outside of this area, fuel will be transported in a mobile double skinned tank. An adequate supply of spill kits and hydrocarbon adsorbent packs will be stored in this area. All relevant personnel will be fully trained in the use of this equipment. Guidelines such as "Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001) will be referred to.

Should reinstatement of hard-standing be required in the demolition areas, the pouring of concrete will take place within a designated area using a geosynthetic material to prevent concrete runoff into the soil/groundwater media. Wash down and washout of concrete transporting vehicles will take place at an appropriate facility.

Surface Water Runoff

Where possible, silty water will be disposed of to the foul sewer but only after appropriate treatment to the standard required by KCC , a TEDL (Trade Effluent Discharge Licence) for the discharge (if required) will contain information relating to the volume disposed of and will be in accordance with Local Authority conditions. Further details on the surface water collection systems on site are presented below.

Environmental Management System

During the construction phase, all works will be subject to Intel's environmental management system. A variety of best available techniques are applied to ensure a high standard of environmental protection is provided during the operational lifetime of the Intel Ireland plant. The measures focus on preventing residuals from initially being generated and having control measures in place for any accidental emissions.

A comprehensive environmental management system operates to ensure staff onsite are suitably trained and know how to both prevent releases from occurring and what to do in the event of a release. This includes defined procedures to ensure that chemicals are handled and stored correctly. By applying best available techniques and operating a comprehensive environmental management system in order to prevent chemical releases to the environment, potential residuals associated with water and land in particular are also minimised.

Measures in place to prevent environmental incidents or minimise their impact in the event of occurring are summarised below.

Systems are built into the design of the site to ensure that environmental media are not impacted in the event of a spillage or fire. This applies to all production areas of the site. The systems are based on the principal of segregating potentially contaminated surface waters and ensuring suitable storage and containment is present in the event of contaminated material being generated.

Intel has also developed training programmes that are aimed at all staff levels within the organisation. The training packages include modules for best practice, general environmental awareness and emergency response.

Double Contained Systems
All chemicals are stored in double contained or bunded areas with monitors in place to identify leaks in containment areas. Bunds storing chemicals are lined with chemical resistant coating and a certified engineer checks the integrity of the bunds as part of the conditions under the existing IPPC licence (Register P0207-03). Process tools that use hazardous chemicals are also held in contained areas.

Segregated Surface Water Systems
Two types of surface water collection systems are in place onsite. The uncontained surface water system takes surface water from areas of the plant where chemicals are not stored. These are discharged to the Rye Water via a retention pond. The contained surface water system serves areas where chemicals are used, stored or transferred with the exception of the western service road. The contained system allows surface water to be rerouted to either dedicated underground tanks in the service yard or the AWN of each FAB in the event of a chemical spill or fire. Contaminated waters are therefore prevented from reaching the Rye Water, ground or groundwater. Approved contractors check the integrity of the tanks within the contained systems as required by existing IPPC licence conditions. These integrity checks are reported to the Environmental Protection Agency (EPA) within the AER.

Grit and Oil Interceptors and the Retention Pond
To ensure the quality of discharges to the Rye Water, all surface waters collected by the storm sewer system is discharged to the River through a retention pond having passed through grit and oil interceptors. The outlet of the retention pond can be closed in the event of a spill or fire.

Emergency Response
Trained members of the Emergency Response Team (ERT) are available onsite 24 hours a day to coordinate and manage any environmental incident and to minimise the consequences should an incident occur. The effectiveness of the environmental management and containment systems in preventing uncontrolled releases to the environment is demonstrated in the low number of incidents that have occurred to date.

Implementation of the above remediation measures during the construction phase and the application of Intel's environmental plan to the construction works management plan will reduce the impact from slight-moderate to **imperceptible**.

7.5.2 OPERATIONAL PHASE

The site-wide mitigation measures and spill control programme in place at the Intel Ireland site which is implemented as part of the environmental management plan will apply to the development during the operational phase. A summary of the environmental measures is presented in below.

Intel has implemented thorough environmental monitoring and chemical management procedures and consequently has had few contaminant releases to the environment.

The objective of maximising the quantity of clean runoff water discharged directly to the River Rye Water while avoiding discharges of contaminated water is met at Intel by an integrated storm water management system incorporating the following features:

1. Isolation of Chemical Unloading Areas
2. Collection of potentially contaminated runoff water in the contained storm sewer (CSS)
3. Routing uncontaminated water away from the CSS system
4. Collection of site runoff waters at the site retention pond.

Primary, secondary and tertiary containment is in place for all potentially hazardous materials. Primary containment relates to the storage vessel the materials are contained in such as totes or tanks. These are checked to ensure their integrity. Secondary containment is also provided via double containment on piping for non-welded lines and bunding of storage containers or storage areas. An ongoing bund integrity and drain testing programme exists as part of current IPPC licence requirements to ensure the

high standard of such containment measures. The CSS and retention pond provide additional tertiary containment measures in the unlikely event of uncontained spills (arising from failure of both the primary and secondary measures) occurring.

Ongoing surface water monitoring as part of the IPPC requirements has found no evidence of pollution in the Rye Water, while a review of environmental incidents has found only three releases with the potential to have a residual impact on the surface water environment since operations began. Each of these releases was investigated and the necessary remediation works were implemented to the satisfaction of the EPA. A Residual Management Plan assessment has been carried out, as part of the IPPC requirements and identified minor-moderate residual liability associated with previous environmental incidents.

Implementation of the above remediation measures during the operational phase and the application of Intel's environmental management plan to the operational phase will reduce the impact from moderate to **imperceptible**.

7.6 PREDICTED IMPACT

This section describes the predicted impact of the proposed development following the implementation of the remedial and mitigation measures.

7.6.1 CONSTRUCTION PHASE

The implementation of the remedial and mitigation measures highlighted in section 7.1.5.1 will ensure that inputs to, and subsequent contamination of, the surface water environment does not occur during normal and/or emergency conditions in the construction phase and that the impact will be imperceptible.

7.6.2 OPERATIONAL PHASE

The implementation of the remedial and mitigation measures highlighted in Section 7.1.5.2 and Intel's environmental management plan, will ensure that inputs to, and subsequent contamination of, the surface water and groundwater environment does not occur during normal and/or emergency conditions in the operational phase and that the impact will be imperceptible.

7.7 MONITORING

Monitoring during the Construction Phase of the development should consist of the following:-

- Normal quality control inspection of the works
- Inspections of the surface water drains following completion of stages of the construction to ensure that the required construction standards are being maintained.

Monitoring during the operational phase of the development is recommended as follows:-

- All filters, silt traps, hydro-brakes and overflows will be inspected regularly ensure that they are not blocked.
- Pollutants which accumulate within the oil interceptors on site will be regularly monitored and removed as necessary.

7.8 REINSTATEMENT

Reinstatement at completion of the works will involve:

- The cleaning of the existing sewers in the vicinity of the development as required.
- Leaving the area in a neat and clean condition, removing all deleterious materials that may have been deposited during construction works

7.9 WASTE WATER

This section has been prepared to identify and assess the impact on the surrounding foul and combined sewer networks in the area of the proposed development and on the receiving waters of the River Liffey.

7.9.1 RECEIVING ENVIRONMENT

Intel have a consent in place with Kildare County Council under Section 99E of the Environmental Protection Agency Acts to discharge effluent in accordance with the stated conditions to the municipal foul sewer system for treatment at the Leixlip MWWTP. This will be amended by Kildare County Council to reflect the requested alterations to the emitted loads.

The current sewer capacity has not changed from 900m^3/hr since the original licence application December 1996. Of that capacity, 720m^3/hr is allocated to Intel from the Leixlip MWWTP which has never been fully utilised to date. In anticipation of the proposed increased discharge from the Intel site, a new parallel pumped line has been designed which will more than double the capacity and provide redundancy.

From the inception of the Intel Ireland site, an agreement was put in place with Kildare County Council to cater for the water supply to the site and the disposal of effluent off site to a dedicated section of the Leixlip WWTP referred to as the "Intel Stream". The construction of this section was funded by Intel and the operating costs are reimbursed to Kildare County Council under the Polluter Pays Principle. These arrangements preceded the introduction of this system nationally under the National Water Pricing Policy and are consistent with both the Water Framework Directive and the Water Services Act 2007.

A Preliminary Report was prepared in June 2000 for the upgrade and expansion of the existing Leixlip WWTP, also known as the Lower Liffey Valley Wastewater Treatment Plant (WWTP). Tender Documents and an Environmental Impact Statement (EIS) were prepared for the proposed expansion of the wastewater treatment plant to 150,000 PE based on a flow of 34,560m3/day.

This EIS was approved by An Bord Pleanála in 2006. The expansion of the wastewater treatment plant is included on the Water Services Investment Programme 2010 – 2012. The wastewater treatment plant has also been issued a wastewater discharge licence (WWDL) from the EPA. It is necessary to upgrade of the existing wastewater treatment plant in order to comply with the requirements of the WWDL.

A report was prepared by Nicholas O'Dwyer in November 2011 to examine the impact of increasing the flow from Intel from the IPPC licensed flow of 16,500m^3/day to 23,000m^3/day. This report concluded that the proposed wastewater treatment plant upgrade would be capable of accepting the increased flow with some minor changes to the proposed upgrade works. These proposed changes have been incorporated into the Tender Documents for the upgrade works.

The following sections describe the hydrology and water quality of the receiving water. The focus is on the river from downstream of the dam at Leixlip to Lucan. There are no drinking water abstractions downstream of Leixlip. Water was abstracted at Lucan for a woollen mill but this ceased some years ago.

The main beneficial uses of the river are angling, water contact sports and leisure activities, general amenity of the river valley and reception of wastewater from the treatment plant at Leixlip. From Lucan to Islandbridge, the river flows through an area designated as a Special Amenity Area. The Special Amenity Area Order was made in 1990/91 and is more concerned with control of land use and development rather than water quality.

The River Liffey is classed as being of "Good Status" under the classifications listed in the Water Framework Directive, and the upgrades to the WWTP will ensure that the WWTP continues to provide the high level of treatment necessary to ensure that "Good Status" is maintained.

7.9.1.1 HYDROLOGY

The hydrology of the Liffey is described in detail in the Water Quality Management Plan (WQMP) for the River Liffey. With the construction of dams and impoundments at Pollaphuca, Golden Falls and Leixlip in the 1930/40's, the flow in the river is now a controlled flow. The Electricity Supply Board (ESB), Dublin City Council (DCC) and Fingal County Council (FCC) all have 'rights' defined in various agreements to use the waters in such a way that they do not interfere with each other. Effectively, the ESB controls the flow because it operates the three dams. The following table of data was taken from the WQMP. The data was calculated assuming a release of 1.5 m3/s from Pollaphouca and ignores the water abstraction by KCC at Leixlip.

Percentile	30	40	50	60	70	80	90	95	DWF
Flow Rate	11.2	9.0	7.4	6.2	5.1	4.4	3.8	3.3	2.5

Table 7.7 Estimated rates of flow (m^3/s) at Leixlip (upstream of Rye Water confluence) which would be equalled or exceeded for stated % of time

For the Leixlip WWTP design, the low flow was taken to be 2 m^3/s.

Both DCC and KCC abstract water for public supply from the river system and most of it does not return to the river as the 'return' points are in Dublin Bay (the Pigeon House and Howth sewage discharges). The only returns are at the regional wastewater treatment plants at Osberstown (near Naas) and Leixlip, both of which are operated by Kildare County Council.

A study on minimum flows was carried out by Professor C Cunnane (1995) of the Department of Engineering Hydrology at UCG. This was to assist in the design of the expansion and upgrading of the wastewater treatment plant at Leixlip. Examination of the hydrographic records, some of which date from 1922, by Professor Cunnane showed that in 15 out of 20 years's records, 2 m^3/s was the minimum flow at Leixlip. In the other 5 years, the minimum flow was sometimes less than 2 m^3/s for reasons which included the necessity to reduce the flow to permit engineering works and maintenance e.g., annual power station maintenance at Leixlip. Professor Cunnane also showed that the minimum flow could be increased to 2.5 m^3/s but that this would result in a lack of flexibility in ESB generating operations in dry years (source; EIS for expansion and upgrade of Leixlip wastewater treatment plant, prepared for Kildare County Council).

7.9.1.2 TREATMENT SYSTEM

Intel Ireland originally funded the construction of a dedicated waste water treatment plant at the site of the Leixlip MWWTP. The designers took into account, (i) the Water Quality Management Plan (WQMP) for the River Liffey, which has now been adopted by all of the local authorities in the Liffey's catchment and (ii) the Environmental Protection Agency Act, 1992 (Urban Waste Water Treatment) Regulations, 1994 (S.I. No. 419 of 1994).

The main quality criteria for the Liffey in the Water Quality Management Plan are as follows:

Parameter	Percentile	Criterion
BOD, mg/l O2	95	≤ 5
	50	≤ 3
Ammonia, total, mg/l N	95	≤ 0.5
	50	≤ 0.2
Oxidised-Nitrogen, mg/l N	99.9	≤ 11
	95	≤ 5
	50	≤ 3
Ortho-Phosphate, mg/l P	95	≤ 0.1
	50	≤ 0.05
Suspended Solids		25*

* Annual Average

Table 7.8 Water Quality Management Plan – Water Quality Criteria

The water quality objectives of that plan and the requirements of the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (SI 272 of 2009) have now been taken into account in the WWDL (D0004-01) issued by EPA for Leixlip WWTP.

Based on 24 hour flow proportional composite sampling, the main organic, physicochemical and nitrogen limits are:-

Parameter	WWDL	
pH	6 - 9	
Temperature (^oC)	25	
Oils, fats and grease (mg/l)	15	
BOD_5 (mg/l)	8	
COD (mg/l)	100	
Suspended Solids (mg/l)	20[1]	15[2]
Total Phosphorous (mg/l P)	1.0[1]	0.5[2]
Orthophosphate (mg/l P)	0.39[2]	
Nitrite (mg/l N)	1	
Nitrate (mg/l N)	14.9	
Total Oxidised Nitrogen (mg/l N)	15.9	
Ammonia (mg/l N)	2.75[2]	

Note: [1] denotes standards to apply up to 30th January 2012
[2] denotes standards to apply after 31st January 2012

Table 7.9 Principal Organic, Physiochemical and Nitrogen Levels

The design capacity of the Leixlip plant has been previously submitted and evaluated in detail and has been separately assessed by the EPA as part of the WWDL licensing process.

The Intel Stream of the municipal treatment plant at Leixlip was very conservatively designed and this, coupled with the conservation measures implemented by Intel Ireland, has led to both good treatment performance and the availability of reserve capacity.

The basic parameters which are managed by the non-Intel stream are:-

- Conveyancing of the effluent to the plant
- Surge management at the inlet works
- BOD and COD removal biologically which in turn is reflected in aeration basin capacity, aeration delivery, final clarification
- Partial Total Nitrogen and Ammonia removal
- Phosphorus removal by biological uptake and co -precipitation
- Residual sludge management and disposal

On the basis of the original licensed loads, the Intel Treatment Stream was conservatively designed to cater for the following loadings. As the BOD concentration of the Intel Wastewater is currently low, it is necessary to combine some of the wastewater from the Catchment with the wastewater from Intel so as to maintain the desired level of BOD in the aeration system. In these circumstances, the following loadings are treatable by the Intel Stream:-

Parameter	Value
Net Flow	20,827 m³/d
Total Incoming Nitrogen Load	644 kg/d
Total Nitrogen Removed in Biotic and Anoxic Processes	456 kg/d
Maximum Intel domestic flow	1,539 m³/d
Maximum cross contributing flow from Main Plant	7,314 m³/d
Maximum initial design for Intel trade Effluent	14,300 m3/d
Total Maximum Flow	23,153 m³/d

Table 7.10 Loadings Treatable by the Intel Stream

Importantly, the Patrick J. Tobin report on available capacity of 18th November 2002 noted that although the revision of the IPPC licence had limited Intel to a total nitrogen discharge of 540 kg N /day, that the plant had a design capacity of 585 kg N/day which is almost exactly currently estimated for the FAB 24C project.

In fact, this design capacity is, in itself, conservative as the installed aeration capacity and hydraulic capacities would allow for an even greater BOD and nitrogen loading without modification of the plant.

A methanol denitrification system was installed but has not proven necessary to operate as yet in connection with Intel's effluent. The in-situ denitrification using domestic effluent as the oxygen demand has proven to be very successful.

Therefore, the performance of the Intel Stream has been very satisfactory and is a tribute to a successful design and good plant operation.

An updated report prepared by consultants Nicholas O'Dwyer Consulting Engineers and P.J. Tobin & Co. Ltd on the Lower Liffey Valley Sewerage Scheme Wastewater Treatment Plant Upgrade (November 2011) identified the following proposed final effluent standards for a plant expansion to 150,000pe (population equivalent):-

Parameter	Emissions Limit Value
pH	6 - 9
Temperature (°C)	25
Oils, fats and grease (mg/l)	15
BOD_5 (mg/l)	5.7
COD (mg/l)	71.3
Suspended Solids (mg/l)	10.7
Total Phosphorous (mg/l P)	0.36
Orthophosphate (mg/l P)	0.28
Nitrite (mg/l N)	0.71
Nitrate (mg/l N)	10.6
Total Oxidised Nitrogen (mg/l N)	11.3
Ammonia (mg/l N)	0.62

Table 7.11 Proposed Final Effluent Standards for Leixlip WWTP Expansion to 150,000pe

7.10 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

Each FAB building on the Intel site has a dedicated Acid Waste Neutralisation plant or AWN. There are 4 AWN plants currently in operation for FAB 10, FAB 14, FAB 24 and FAB 24-2. All process waste waters from the site pass through the relevant AWN before being discharged to sewer via an Effluent Balance Tank (EBT). This includes water from cooling tower and boiler blow-down, process water and acids from wet stations, acid baths and rinses along with any contaminated water collected in the surface water containment system should it occur.

The AWN systems consist of three tanks in series that add in either sulphuric acid or sodium hydroxide solution to the wastewater to adjust the pH to a neutral condition. The incoming water is typically acidic in nature and, therefore, sodium hydroxide is normally dosed to the tank water. The pH is measured by two pH probes with back up probes. The maximum pH adjustment that can occur in any one tank is 2.5 to prevent the potential for significant overdosing and hence an overshoot in the actual pH condition. If additional pH adjustment is required, this is carried out in the next tank. Water discharged from the AWN is within the pH range of 6 to 9.5. Each tank can be bypassed if necessary to allow maintenance to be carried out.

The on-site AWN plants will discharge to the existing sites effluent balance tank (EBT) where the effluent is mixed and discharged to sewer. The effluent monitoring point is downstream of this mixing point. A 24 hour composite sample is taken weekly and analysed by an independent laboratory for the parameters identified in the IPPC licence conditions.

Discharges to sewer comprise organic and inorganic fractions that are most appropriately treated offsite at the Leixlip MWWTP. Abatement plants are in place to remove metals from aqueous streams, reduce the release of fluoride and ammonia containing compounds and ensure discharges are not acidic in nature. The abatement plant in conjunction with offsite treatment at the Leixlip waste water treatment facility is considered to represent Best Available Techniques (BAT). Releases are also balanced before discharge and can be held onsite for a period of up to two hours.

Parameter	Current IPPC Emission Limits	Requested IPPC Emissions Limits	Comment
	kg/day	kg/day	
BOD	1,350	3,800	Increase (BOD level is Indicative, based upon Trials)
COD	2,700	7,600	Increase
SS (Inorganic)	2,700	2,700	No change
TSS	4,125	4,125	No change
TDS	60,570	60,570	No change
TN as N	540	590	10% increase within design
Total P	67.5	140	Increase
Total F	160	160	No change
CN	1.35	1.35	No change
As	1.35	1.35	No change
Cu	4.05	4.05	No change
Cr	1.35	1.35	No change
Ni	2.7	2.7	No change
Pb	1.6	1.6	No change
Total Heavy Metals	13.5	13.5	No change
Flow	16,500 m3/day	23,000 m3/day	Within design

Table 7.12 Proposed Emission Loads from Intel Ireland (including FAB 24C)

Specific Impacts of Components of the Intel Wastewater

No adverse effects on the treatment process at the Leixlip MWWTP from the plant operations have been noted to date. In fact the sludge volume index and nitrification of the Intel Stream is better than the main plant.

All other monitored parameters are found in the wastewater stream at levels which are typically a small fraction of their respective limits.

Consideration has been given to the impact of an accidental discharge of a chemical substance on the treatment plant. The level of secondary containment provided throughout the site is at such a level that the risk of a spillage entering wastewater drains is correspondingly low.

Kildare County Council have advised that the proposed expansion and upgrade of the Leixlip WWTP has taken the requested loads into consideration in the options proposed.

Currently, this is in the form of a report from Nicholas O'Dwyer Consulting Engineers to Kildare County Council and the intention is that the upgrades will be completed before the capacity is required. As can be seen from the preceding table, most of the requested changes are within the current design capacity in any case.

7.11 POTENTIAL IMPACT

7.11.1 CONSTRUCTION PHASE

The following are the potential impacts of the proposed scheme during the construction stage:

- Mobilisation of sediments and harmful substances during the construction phase, due to exposed soil and earth movement, which may be flushed into sewers during rainfall events if not mitigated;
- Accidental spills of harmful substances such as petrol or oil during the delivery and storage of harmful substances or by leakages from construction machinery.

7.11.2 OPERATIONAL PHASE

Ongoing reviews of the Intel stream at Leixlip MWWTP show that it is compliant and has catered for considerable additional domestic loads over many years. The expanded plant will be subject to the WWDL licensing requirements and the Nicholas O Dwyer report referred to above has demonstrated that the proposed upgrade of the MWWTP will ensure the increased effluent loading is fully treated and that the discharge from the MWWTP remains within the limits set by the EPA in the Waste Water Discharge Licence for the Leixlip MWWTP.

Likely effects on sewer maintenance
The substances most likely to effect sewer maintenance operations are:-

- volatile toxic substances (toxic gases)
- flammable substances (hydrocarbons, solvents etc.)
- strongly acidic / alkaline and irritant substances (acids and alkalis).

Intel uses a number of substances as raw materials that fall into these groupings. The segregation and abatement systems on site will ensure that no substances are discharged to the foul sewer at a harmful concentration. Intel does not discharge substances in any manner or concentration that will have an adverse effect on the sewer system or sewer workers.

Likely effects on sewer integrity
The substances most likely to effect sewer integrity are:-
(i) strong acids and alkalis
(ii) excessive sulphate concentrations

Strong acids and alkalis
The AWN system ensures that the pH remains within the appropriate range so that damage to the sewer integrity will not occur. The wastewater discharge does not contain any other substances known to effect sewer integrity. Substances likely to cause blockages or to form encrustations on sewer internal surfaces are not being discharged from the Intel site.

Sulphate
Aqueous solutions of sulphates are known to react with the cement in concrete pipes. The chemical reactions involved are expansive and hence cause disruption to the concrete structure. The severity of the effects is dependent on the nature of the cement and the type of aggregate used and on the

sulphate concentration present. Dense concrete pipes manufactured to BS 5911 or IS 6 are suitable for effluents with a sulphate content of up to 1,400ppm. Irish made Normal Portland Cement has a higher resistance to sulphates due to its composition. The fact that Intel discharge to the Kildare County Council sewer has a sulphate concentration of an average of less than 400ppm (mg/l), means there should be no detrimental effect to the sewer infrastructure even at full permitted concentration.

Possible reactions with other waste waters in sewers:
Intel is the only industrial discharger of wastewater to this section of the sewer. Consequently no interaction with other wastewaters is envisaged.

7.12 MITIGATION MEASURES

7.12.1 CONSTRUCTION PHASE

Effluent generated on the site from the contractor's sanitary facilities will be discharged to a holding tank and removed off site by a certified waste removal contractor in accordance with the requirements of the Waste Management Act of 1996-2007.

The following mitigation measures to mitigate the impact of the construction phase on the existing environment are proposed:-

- Where connections of the new sewers to the existing sewers occur, all sewer connections should be made under the supervision of the Local Authority and checked prior to commissioning;
- Road sweeping and/or wheel wash facilities will be provided, as required;
- All sewers will be inspected and where necessary sealed to ensure that uncontrolled ground water inflow does not occur;
- Any leakage from the foul sewer will be cordoned off and the contaminated effluent and soil collected and disposed by licensed contractors.

7.12.2 OPERATIONAL PHASE

Dual & low flush toilets and water economy outlets will be used to reduce flows from the development.

7.13 PREDICTED IMPACT

This section describes the predicted impact of the proposed development following the implementation of the remedial and mitigation measures.

7.13.1 CONSTRUCTION PHASE

The implementation of the remedial and mitigation measures highlighted in Section 8.3.4.1 will ensure that inputs to, and subsequent contamination of, the surface water environment does not occur during normal and/or emergency conditions in the construction phase and that the impact will be imperceptible.

7.13.2 OPERATIONAL PHASE

Since the submission and assessment of the FAB 24 EIS, the practice of applying the criteria limiting the quality of the combined discharge of the 'stand alone' plant and the KCC municipal plant against the assimilative capacity has been continued. Most recently, these have been applied by EPA in consideration of the standards to be met under the Leixlip WWTP WWDL criteria and take into account the requirements under European Communities Environmental Objectives (Surface Water) Regulations 2009 (SI 272 of 2009).

The options recommended to KCC by the Nicholas O'Dwyer report are based on a similar mass balancing exercise taking the proposed Intel FAB 24C discharges into account and taking due consideration of both the WWDL and Surface Water Quality Criteria (whichever is the more stringent).

Therefore, on the basis of confidence of current and earlier experience and in the design recommendations of the Nicholas O'Dwyer report, it can be concluded the proposed discharges will not

cause the WWDL limits to be exceeded and the increased effluent discharge associated with the FAB 24C project will have an imperceptible environmental impact on the River Liffey.

7.14 MONITORING

7.14.1 CONSTRUCTION PHASE

Monitoring during the Construction Phase of the development will include the following:-

- Normal quality control inspection of the works;
- Monitoring of possible discharges to the existing culverted watercourse to ensure that no unauthorised discharges are occurring;
- Pressure testing and CCTV inspections of the foul sewers following completion of stages of the construction is recommended to ensure that the required construction standards are being maintained;
- Upon completion of the development, monitoring of the discharges from the development will be undertaken as required.

7.14.2 OPERATIONAL PHASE

Ongoing monitoring will be conducted in line with the Intel IPPC Licence.

7.15 REINSTATEMENT

Reinstatement at completion of the works will involve:

- The cleaning and sterilisation of the existing sewers in the vicinity of the development as required;
- All excavations will be fully reinstated to the requirements of Kildare County Council; and
- Leaving the area in a neat and clean condition, removing all deleterious materials that may have been deposited during the construction works.

During the operational Phase no reinstatement works are envisaged upon completion of the development.

7.16 WATER SUPPLY

This section has been prepared to identify and assess the impact on the water supply networks in the area of the proposed development. The following sources of information were used in the completion of this assessment:

- Kildare County Council Water Main Maps.
- Site Survey Information.

In order to determine the existing conditions of the surrounding water network, Kildare County Council records were obtained. Discussions and meetings with Kildare County Council were held to determine the demand from the site and ensure that the capacity of the existing network could sustain the proposed development.

7.16.1 RECEIVING ENVIRONMENT

The Greater Dublin Water Supply is supplied from raw water sources at Leixlip, Roundwood, Ballyboden and Ballymore Eustace and supplies approximately 1.3 million people within the Dublin City, Fingal, Dun Laoghaire Rathdown, South Dublin, Wicklow, Kildare and Meath Council areas. The Greater Dublin Water Supply Strategic Study Report 1996-2016 was published in 1996 and outlined a 20 year investment strategy to address drinking water needs.

The existing water main supplying the Intel Leixlip site has a capacity of up to 21 MLD (mega litres per day) provided a number of engineering upgrades (enhancement of pump-sets and additional bracing measures) are put in place. Current demand from Intel is in the region of 11-13 MLD.

A new reservoir has been previously constructed at Castlewarden, fed from the Water Treatment Plant at Ballymore Eustace and a new trunk main will be constructed from Castlewarden to Ballygoran (which is located approximately 2 miles south of the Intel site).

A separate water main will be constructed from Ballygoran to Collinstown, with a capacity of 37 MLD, the detailed design of which is underway at the moment.

7.17 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

Once the proposed FAB 24C development is operational, the Intel site will require up to 25 MLD/day of mains water supply.

7.18 POTENTIAL IMPACT

7.18.1 CONSTRUCTION PHASE

During the connection of existing to temporary and from temporary to new, contamination of the existing supply may occur. There may also be some temporary disruption to the water supply in the area.

7.18.2 OPERATIONAL PHASE

The proposed development will result in an increased demand for water from the municipal water supply system, estimated to increase from approximately 15-17 MLD maximum to 21 MLD maximum. The Intel site will require a maximum water supply of up to 25 MLD once FAB 24C is complete, however this demand figure would only be reached in the event that all FABs on the Intel site are operating at maximum capacity.

Intel commit to demanding no more than the capacity of the existing water main (21MLD with required upgrades) from the KCC water supply system until such time as the 37 MLD water supply is available to the Intel site.

7.19 MITIGATION MEASURES

7.19.1 CONSTRUCTION PHASE

No additional connections to public water mains off site are required. Any connections to water mains on site will be carried out in full compliance with the requirements of KCC.

7.19.2 OPERATIONAL PHASE

The water main system will be metered as directed by the Council to facilitate detection of leakage and the prevention of water loss.

Dual & low flush toilets and water economy outlets and water saving measures in the production process will be implemented.

Intel commit to demanding no more than the capacity of the existing water main (21MLD with required upgrades) from the KCC water supply system until such time as the 37 MLD water supply is available to the Intel site.

7.20 PREDICTED IMPACT

This section describes the predicted impact of the proposed development following the implementation of the remedial and mitigation measures.

7.20.1 CONSTRUCTION PHASE

The implementation of the remedial and mitigation measures highlighted in 7.3.4.1 will ensure that the impact on water supply during construction will be imperceptible.

7.20.2 OPERATIONAL PHASE

The implementation of the remedial and mitigation measures highlighted in 7.3.4.2 will ensure that the impact on water supply during operation will be imperceptible.

7.21 MONITORING

Construction phase monitoring will be carried out to ensure that construction methodologies are adhered to and that pressure testing of mains, cleansing of mains and the making of mains connections are carried out to accepted standards and Kildare County Council requirements.

Metering will allow the water supply to the development to be monitored, this will be done to the requirements of Kildare County Council.

7.22 REINSTATEMENT

All excavations will be fully reinstated to the requirements of Kildare County Council.

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8. AIR QUALITY AND CLIMATE

8.1 INTRODUCTION

The modelling of air emissions from the site was carried out to assess the ground level concentrations of ammonia (NH_3), volatile organic compounds (VOCs) and Nitrogen Dioxide (NO_2) and the consequent impact on human health and vegetation. The assessment of both "do nothing" and "do something" scenarios was undertaken in order to quantify the impact of the proposed development in the context of relative increase in ambient air quality concentrations.

8.1.1 MODELLING METHODOLOGY

Dispersion modelling has been carried out to predict the ground level concentrations of NO_2, NH_3 and VOC emitted from the FAB 10, FAB 14, FAB 24 and FAB 24-2 emission points both for the "do nothing" and "do something" scenarios. The United States Environmental Protection Agency (USEPA) developed AERMOD dispersion model was used. To obtain all the meteorological information required for use in the model, data collected during 2006 - 2010 from Casement Aerodrome has been incorporated into the modelling. Ground level concentrations (GLC) have been predicted for every hour during the relevant years. A windrose for Casement Aerodrome 2006 - 2010 meteorological data detailing frequency of wind directions and windspeeds is illustrated in **Figure 8.1**.

The air dispersion modelling input data consisted of information on the physical environment (including building dimensions and terrain features), design details from all emission points on-site and five full years of appropriate meteorological data. Using this input data the model predicted ambient ground level concentrations beyond the site boundary for each hour of each modelled meteorological year. The model post-processed the data to identify the location of the maximum worst-case ground level concentration in the applicable format for comparison with the relevant limit values. This worst-case concentration was then added to the background concentration to give the worst-case predicted ambient concentration. The worst-case predicted ambient concentration was then compared with the relevant ambient air quality standard to assess the significance of the releases from the site.

Throughout this study a worst-case approach was taken. This will most likely lead to an over-estimation of the levels that will arise in practice. The worst-case assumptions are outlined below:

- Emissions from all relevant emission points were assumed to be operating at the maximum limit of the applicable IPPC Licence emission level, 24 hours/day over the course of a full year;
- All emission points were assumed to be operating at their maximum volume flow, 24 hours/day over the course of a full year;
- Maximum predicted ambient concentrations were reported in this study even though, in most cases, no residential receptors were near the location of this maximum;
- Appropriate background concentrations were used to assess the baseline levels of substances released from the site.

Emissions from the Intel Ireland Ltd site have been modelled using the AERMOD dispersion model which has been developed by the U.S. Environmental Protection Agency (USEPA) and the American Meteorological Society (AMS). The model is recommended as an appropriate model for assessing the impact of air emissions from industrial facilities in the EPA Guidance document “Air Dispersion Modelling from Industrial Installations Guidance Note (AG4) (2010)”.

The model is a “new-generation” steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources. The model is an enhancement of the Industrial Source Complex-Short Term 3 (ISCST3) model which has been widely used for emissions from industrial sources. Details of the model are given in an Appendix to this Chapter of the EIS (Appendix 8.2). Fundamentally, the model has made significant advances in simulating the dispersion process in the boundary layer. This will lead to a more accurate reflection of real world processes and thus considerably enhance the reliability and accuracy of the model particularly under those scenarios which give the rise to the highest ambient concentrations.

Due to the proximity to surrounding buildings, the PRIME Building Downwash Program (BPIP Prime) has been incorporated into the model to determine the influence (wake effects) of these buildings on dispersion in each direction considered.

The AERMOD model incorporated the following features:

- A 3 tiered embedded receptor grid was identified at which concentrations would be modelled. The receptors were mapped with sufficient resolution to ensure all localised "hot-spots" were identified without adding unduly to processing time. Modelling was carried out covering an area of 20km^2 with the site at the centre. The outer grid consisted of receptors every 1000m extended to 10km. The middle grid extended to 5km from the site and consisted of receptors every 250m. The inner grid extended to 1.75km from the site and consisted of receptors every 100m. In addition, boundary receptor locations were placed along the boundary of the site, spaced every 50m, giving a total of 3463 calculation points for each model case.
- All on-site buildings and significant process structures were mapped into the computer to create a three dimensional visualisation of the site and its emission points. Buildings and process structures can influence the passage of airflow over the emission stacks and draw plumes down towards the ground (termed building downwash). The stacks themselves can influence airflow in the same way as buildings by causing low pressure regions behind them (termed stack tip downwash). Both building and stack tip downwash were incorporated into the modelling.
- Hourly-sequenced meteorological information has been used in the model. AERMOD incorporates a meteorological pre-processor AERMET PRO which allows AERMOD to account for changes in the plume behaviour with height using information on the surface characteristics of the site. AERMET PRO calculates hourly boundary layer parameters for use by AERMOD, including friction velocity, Monin-Obukhov length, convective velocity scale, temperature scale, convective boundary layer (CBL) height, stable boundary layer (SBL) height, and surface heat flux (see Appendix 8.2).
- Detailed terrain has been mapped into the model. The site is located adjacent to a valley which is directly to the north of the plant. The terrain rises sharply for a few hundred metres to the north of this valley. The surrounding area to the west and south is characterised by generally gentle changes in terrain which have also been mapped into the model.

8.1.2 AMBIENT AIR QUALITY STANDARDS

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health- or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set (see **Tables 8.1-8.2**).

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the *Air Quality Standards Regulations 2011* which incorporate *European Commission Directive 2008/50/EC*, which have set limit values for the pollutants SO_2, NO_2, PM_{10}, $PM_{2.5}$, benzene and CO (see **Table 8.1**).

8.1.3 CLIMATE AGREEMENTS

Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) in April 1994 and the *Kyoto Protocol* in principle in 1997 and formally in May 2002 (Framework Convention on Climate Change, 1999 and Framework Convention on Climate Change, 1997). For the purposes of the European Union burden sharing agreement under Article 4 of the *Kyoto Protocol*, in June 1998, Ireland agreed to limit the net growth of the six Greenhouse Gases (GHGs) under the *Kyoto Protocol* to 13% above the 1990 level over the period 2008 to 2012 (ERM, 1998). The UNFCCC is continuing detailed negotiations in relation to GHGs reductions and in relation to technical issues such as emissions trading and burden sharing.

8.1.4 GOTHENBURG PROTOCOL

In 1999, Ireland signed the Gothenburg Protocol to the 1979 UN Convention on Long Range Transboundary Air Pollution. The objective of the Protocol is to control and reduce emissions of Sulphur Dioxide (SO_2), Nitrogen Oxides (NO_X), Volatile Organic Compounds (VOCs) and Ammonia (NH_3). To achieve the targets Ireland will, by 2010, have to meet national emission ceilings of 42kt for SO_2 (67% below 2001 levels), 65kt for NO_X (52% reduction), 55kt for VOCs (37% reduction) and 116kt for NH_3 (6% reduction). European Commission Directive 2001/81/EC, the National Emissions Ceiling Directive, prescribes the same emission limits. Emissions of SO_2 and NH_3 from the transport sector are insignificant accounting for less than 2.5% of total emissions in Ireland in 2008. Transport emissions of Nitrogen Oxides (NO_X) and Volatile Organic Compounds (VOCs) are important accounting for 47.4% and 20.1% respectively of total emissions of these pollutants in Ireland in 2008 (EPA, 2010). A National Programme for the progressive reduction of emissions of the four transboundary pollutants is in place since April 2005 (DoEHLG, 2004). A review of the National Programme in 2007 (DEHLG 2007a) showed that Ireland was on target to comply with the emissions ceilings for SO_2, VOCs and NH_3 by 2010, but that the ceiling for NO_X presents a difficulty even with the implementation of additional measures. The most recent data available from the EU in 2009 indicates that Ireland will comply with the emissions ceilings for SO_2, VOCs and NH_3 but will fail to comply with the ceiling for NO_X (EEA 2010).

Pollutant	Regulation Note1	Limit Type	Margin of Tolerance	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	40% until 2003 reducing linearly to 0% by 2010	200 µg/m^3 NO_2
		Annual limit for protection of human health	40% until 2003 reducing linearly to 0% by 2010	40 µg/m^3 NO_2
		Annual limit for protection of vegetation	None	30 µg/m^3 NO + NO_2
Lead	2008/50/EC	Annual limit for protection of human health	100%	0.5 µg/m^3
Sulphur dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	150 µg/m^3	350 µg/m^3
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	None	125 µg/m^3
		Annual & Winter limit for the protection of ecosystems	None	20 µg/m^3
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50%	50 µg/m^3 PM_{10}
		Annual limit for protection of human health	20%	40 µg/m^3 PM_{10}
$PM_{2.5}$ (Stage 1)	2008/50/EC	Annual limit for protection of human health	20% from June 2008. Decreasing linearly to 0% by 2015	25 µg/m^3 $PM_{2.5}$
$PM_{2.5}$ (Stage 2) Note 2	-	Annual limit for protection of human health	None	20 µg/m^3 $PM_{2.5}$
Benzene	2008/50/EC	Annual limit for protection of human health	100% until 2006 reducing linearly to 0% by 2010	5 µg/m^3
Carbon Monoxide	2008/50/EC	8-hour limit (on a rolling basis) for protection of human health	60%	10 mg/m^3 (8.6 ppm)

Note 1 EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

Note 2 EU 2008/50/EC states - *'Stage 2 — indicative limit value to be reviewed by the Commission in 2013 in the light of further information on health and environmental effects, technical feasibility and experience of the target value in Member States'.*

Table 8.1 EU Air Quality Standards (based on European Commission Directive 2008/50/EC)

8.1.5 IMPACT ASSESSMENT

Although no relative impact, as a percentage of the limit value, is enshrined in EU or Irish Legislation, the NRA guidelines (NRA 2006) detail a methodology for determining air quality impact significance criteria for road schemes. The degree of impact is determined based on both the absolute and relative impact of the Proposed Development. The NRA significance criteria have been adopted for the Proposed Development and are detailed in **Tables 8.2 - 8.3**. The significance criteria are based on PM_{10} and NO_2 as these pollutants are most likely to exceed the limit values. However the criteria have also been applied to all pollutants for the purposes of this assessment.

Magnitude of Change	Annual Mean NO_2 / PM_{10}	Days PM_{10} > 50 µg/m^3
Very Large	Increase / decrease >25%	Increase / decrease >25 days
Large	Increase / decrease 15-25%	Increase / decrease 15-25 days
Moderate	Increase / decrease 10-15%	Increase / decrease 10-15 days
Small	Increase / decrease 5-10%	Increase / decrease 5-10 days
Very Small	Increase / decrease 1-5%	Increase / decrease 1-5 days
Extremely Small	Increase / decrease <1%	Increase / decrease <1 days

Source: *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* - National Roads Authority (2006)

Table 8.2 Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Absolute Concentration in Relation to Standard [Note 1]	Change in Concentration					
	Extremely Small	**Very Small**	**Small**	**Moderate**	**Large**	**Very Large**
Decrease with Scheme						
Above Standard with Scheme	slight beneficial	slight beneficial	substantial beneficial	substantial beneficial	very substantial beneficial	very substantial beneficial
Above Standard in Do-min, Below with Scheme	slight beneficial	moderate beneficial	substantial beneficial	substantial beneficial	very substantial beneficial	very substantial beneficial
Below Standard in Do-min, but not Well Below	negligible	slight beneficial	slight beneficial	moderate beneficial	moderate beneficial	substantial beneficial
Well Below Standard in Do-min	negligible	negligible	slight beneficial	slight beneficial	slight beneficial	moderate beneficial
Increase with Scheme						
Above Standard in Do-min	slight adverse	slight adverse	substantial adverse	substantial adverse	very substantial adverse	very substantial adverse
Below Standard in Do-min, Above with Scheme	slight adverse	moderate adverse	substantial adverse	substantial adverse	very substantial adverse	very substantial adverse
Below Standard with Scheme, but not Well Below	negligible	slight adverse	slight adverse	moderate adverse	moderate adverse	substantial adverse
Well Below Standard with Scheme	negligible	negligible	slight adverse	slight adverse	slight adverse	moderate adverse

Note 1 Well Below Standard = <75% of limit value.

Source: *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* - National Roads Authority (2006)

Table 8.3 Air Quality Impact Significance Criteria

8.2 RECEIVING ENVIRONMENT

Ambient monitoring is carried out at 5 selected locations for NO_2. These locations are shown in **Figure 8.2** and described below:

- **Site N1** - Front gate of Intel FAB 10
- **Site N2** - North West of Intel (near Rye Water)
- **Site N3** - North of Intel (Riverview House)
- **Site N4** - North East of Intel (Finger Meadow)
- **Site N5** - East of Intel (near canal)

The results of the monitoring survey carried out over the period 2005 - 2010 as required by the existing IPPC Licence are summarised in **Table 8.4** and in **Figure 8.3**.

Continuous monitoring is also carried out on-site all year round at the monitoring station located to the north of the main IFO process buildings. The continuous monitoring location is also illustrated in **Figure 8.2**. The results for 2009 for the monitoring station are presented in **Figure 8.4** and **Table 8.5**. Results indicate that the annual average NO_2 concentration was 9.0 $\mu g/m^3$ whilst the 99.8th%ile of 1-hr concentrations peaked at 52.0 $\mu g/m^3$.

All NO_2 concentrations measured during the assessment period were well within Council Directive 2008/50/EC 1-hour ambient air quality standard of 200 $\mu g/m^3$ for NO_2 and average values were well within the long-term standard of 40 $\mu g/m^3$. Long-term concentrations varied between 9 $\mu g/m^3$ and 19 $\mu g/m^3$ depending on sampling location.

In relation to NO_2, the background concentration was derived from existing ambient NO_2 levels measured over the period 2005 - 2010 in the vicinity of the Intel Ireland Ltd site using passive diffusion tubes, the continuous NO_X monitor on-site and a review of existing ambient NO_X data available for similar environments to the current site.

As outlined in **Table 8.4**, average ambient NO_2 levels over the period 2005 - 2010 varied from approximately 9 $\mu g/m^3$ north (Riverview House) and north-west (near Rye Water) of the site to approximately 19 $\mu g/m^3$ at the front gate of Intel FAB 10. Thus, the measurements indicated a background level of typically 10 $\mu g/m^3$ with an additional increment near roadside of approximately 5 - 10 $\mu g/m^3$. The contribution from the facility itself is not pronounced but may be in the region of 2 – 4 $\mu g/m^3$ near the boundary of the site.

In terms of air monitoring zones, Leixlip is categorized as Zone D[(1)]. With regard to NO_2, monitoring is carried out at two rural Zone D locations, Glashaboy and Kilkitt[(1)]. The NO_2 annual average in 2009 for both sites was 11 and 3 $\mu g/m^3$, respectively.

Based on a review of the above information, an estimate of the existing background NO_2 concentration in 2011 is 10$\mu g/m^3$.

Ammonia (NH_3)

As no significant background source of ammonia was evident in the region of the facility, no background concentration was included in any of the modelling runs.

Volatile Organic Compounds (VOCs)

VOCs constitute a complex mixture of individual organic compounds. In terms of ambient air quality generally in Ireland, benzene constitutes the most significant VOC with background levels often a significant fraction of measured levels. However, in regards to other individual compounds, background levels in non-urban settings are usually small fractions of the individual Environmental Assessment Levels (EALs). As no significant background source of volatile organic compounds (excluding benzene) was evident in the region of the facility, no background concentration was included in any of the individual modelling runs. A background of 20 $\mu g/m^3$ for Total VOCs was used for Class III (including Class I & II) in all modelling runs.

Contribution from Traffic Emissions

For the purposes of this assessment, the impact of the existing traffic and the worst-case construction phase traffic has been modelled and the contribution from traffic added to the background concentration. The assessment methodology involved air dispersion modelling using the UK DMRB Screening Model (Version 1.03c (UK DEFRA, 2007)) and the NO_x to NO_2 Conversion Spreadsheet (Version 2.1 (UK DEFRA, 2010)) and following guidance issued by the UK DEFRA and following guidance issued by the UK DEFRA (UK DEFRA, 2001, 2009b). The inputs to the air dispersion model consist of information on road layouts, receptor locations, annual average daily traffic movements (AADT), annual average traffic speeds and background concentrations. Using this input data the model predicts ambient ground level concentrations at the worst-case sensitive receptor using generic meteorological data. This worst-case concentration is then added to the existing background concentration to give the worst-case predicted ambient concentration. Although this approach is conservative and represents a worst-case scenario, it ensures that existing baseline concentrations are not under estimated. The results shown in **Table 8.6** indicate that existing traffic derived NO_2 concentrations are in the region of 3.8 – 4.2 $\mu g/m^3$ at the worst-case receptors. However, as the location of the worst-case ambient concentration due to road traffic emissions is to the south of the site and the locations of the worst-case ambient concentration due to process emissions is approximately 1km to the north of this location (see Section 8.4.2.3), the cumulative impact at any one receptor will be significantly less than the sum of the worst-case road traffic ambient concentration and the worst-case process ambient concentration.

Year	N1	N2	N3	N4	N5
2005	19.0	8.4	7.7	12.2	10.4
2006	15.5	9.6	9.4	13.6	10.3
2007	17.7	6.7	7.3	10.8	13.7
2008	19.3	9.5	8.6	15.2	11.2
2009	21.5	9.0	9.2	13.2	11.2
2010	22.4	12.4	12.5	16.0	17.7
5 Year Average	19.2	9.3	9.1	13.5	12.4

Note 1 EU Council Directive 2008/50/EC - Annual average limit value of 40 µg/m^3

Table 8.4 Summary of Diffusion Tube NO_2 Monitoring Results at the Five Monitoring Stations near the Intel Facility (µg/m3)

Monitoring Period	Results	
Period 01/01/09 – 31/12/09	Total No. Days Sampling	365
	No. Hourly Averages >200 µg/m^3	0
	99.8th%ile of 1-Hour Averages	52.0 µg/m^3
	NO_2 Average	9.0 µg/m^3
	Limit Values	**200 µg/m^3 Note 1** **40 µg/m^3 Note 2**

Note 1 EU Council Directive 2008/50/EC - 1-hour limit of 200 µg/m^3 as a 99.8th%ile (i.e. 18 hours >200 µg/m^3 permitted per year).
Note 2 EU Council Directive 2008/50/EC - Annual average limit value.

Table 8.5 Summary of Continuous NO_2 Monitoring Results at On-Site Monitoring Station

	NO_2		VOC	
	R1 Note 1	**R2 Note 2**	**R1**	**R2**
Do Nothing Annual Traffic Contribution	4.2	3.8	2	2
Do Nothing Annual Concentration (Background + traffic)	**14.2**	**13.8**	**22**	**22**
Construction Phase Annual Traffic Contribution	9.8	9.1	3	3
Construction Phase Annual Concentration (Background + traffic)	**19.8**	**19.1**	**23**	**23**

Note 1 R1 is located near the junction of the R148 with Kellystown Lane.
Note 2 R2 is located near the junction of R148 with the main entrance to the site.

Table 8.6 Estimated annual background concentrations in the vicinity of the facility at two worst-case receptors (R1 and R2) (µg/m^3)

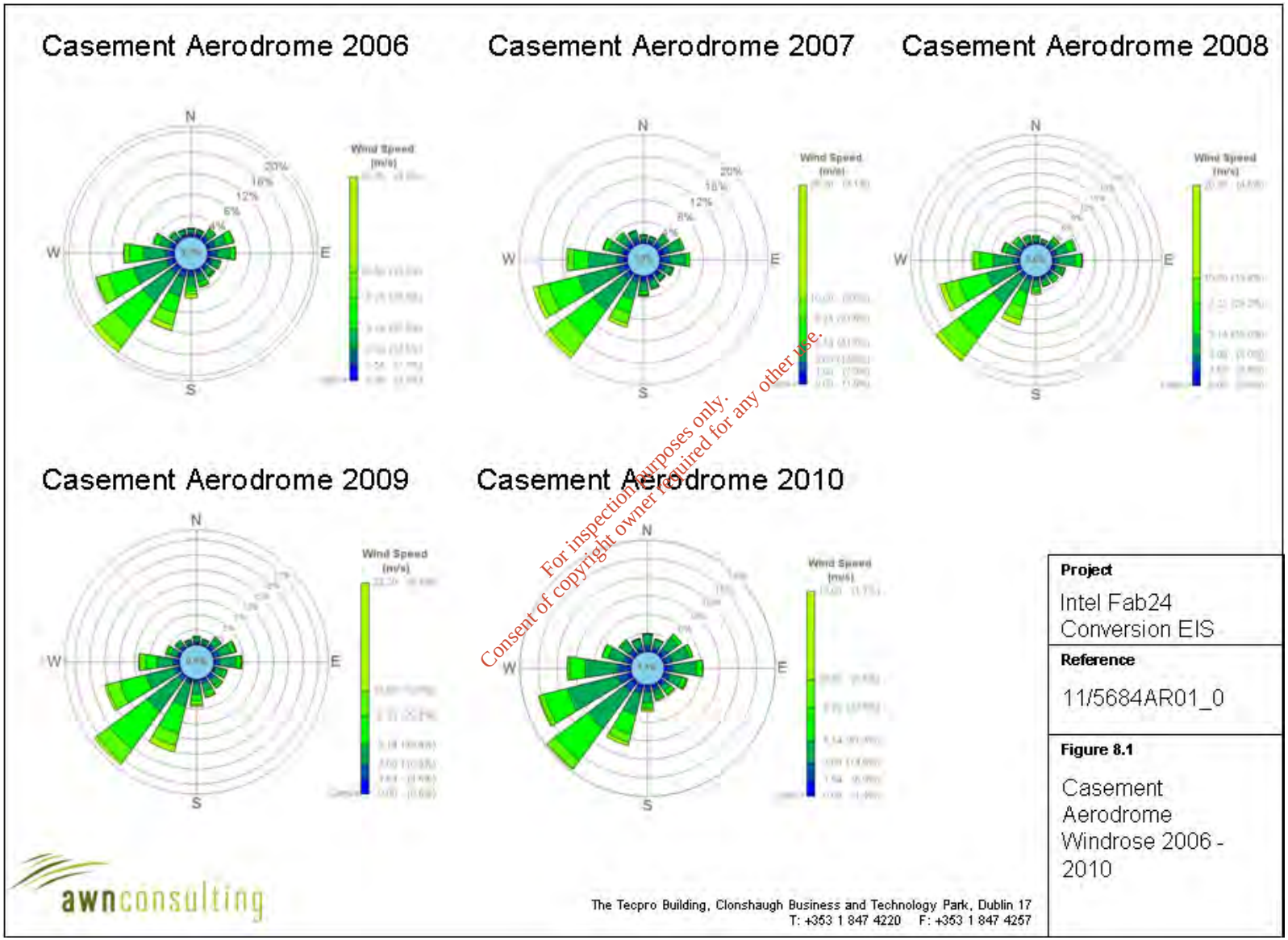

Figure 8.1 Casement Aerodrome Windrose 2006-2010

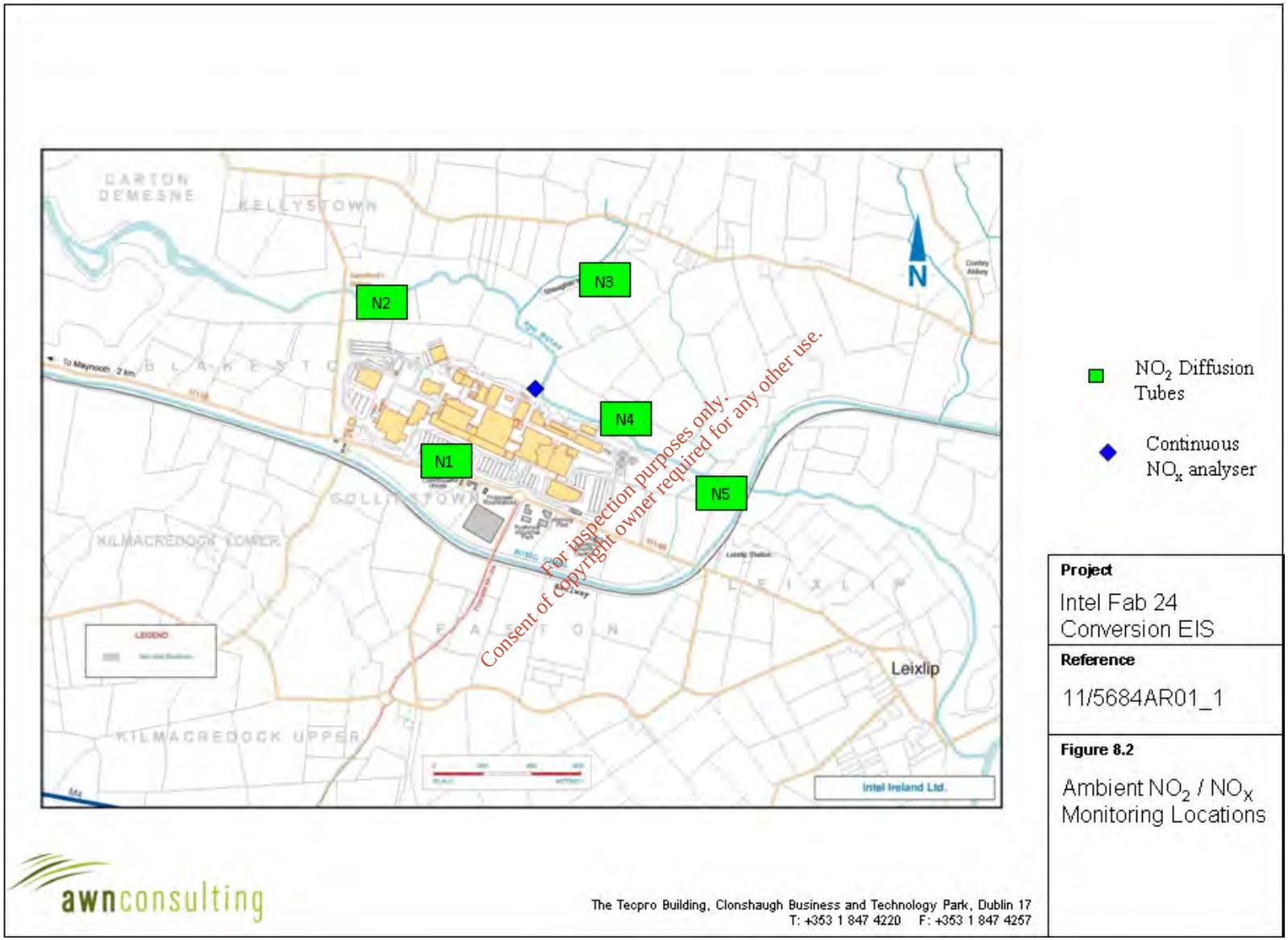

Figure 8.2 Ambient NO_2

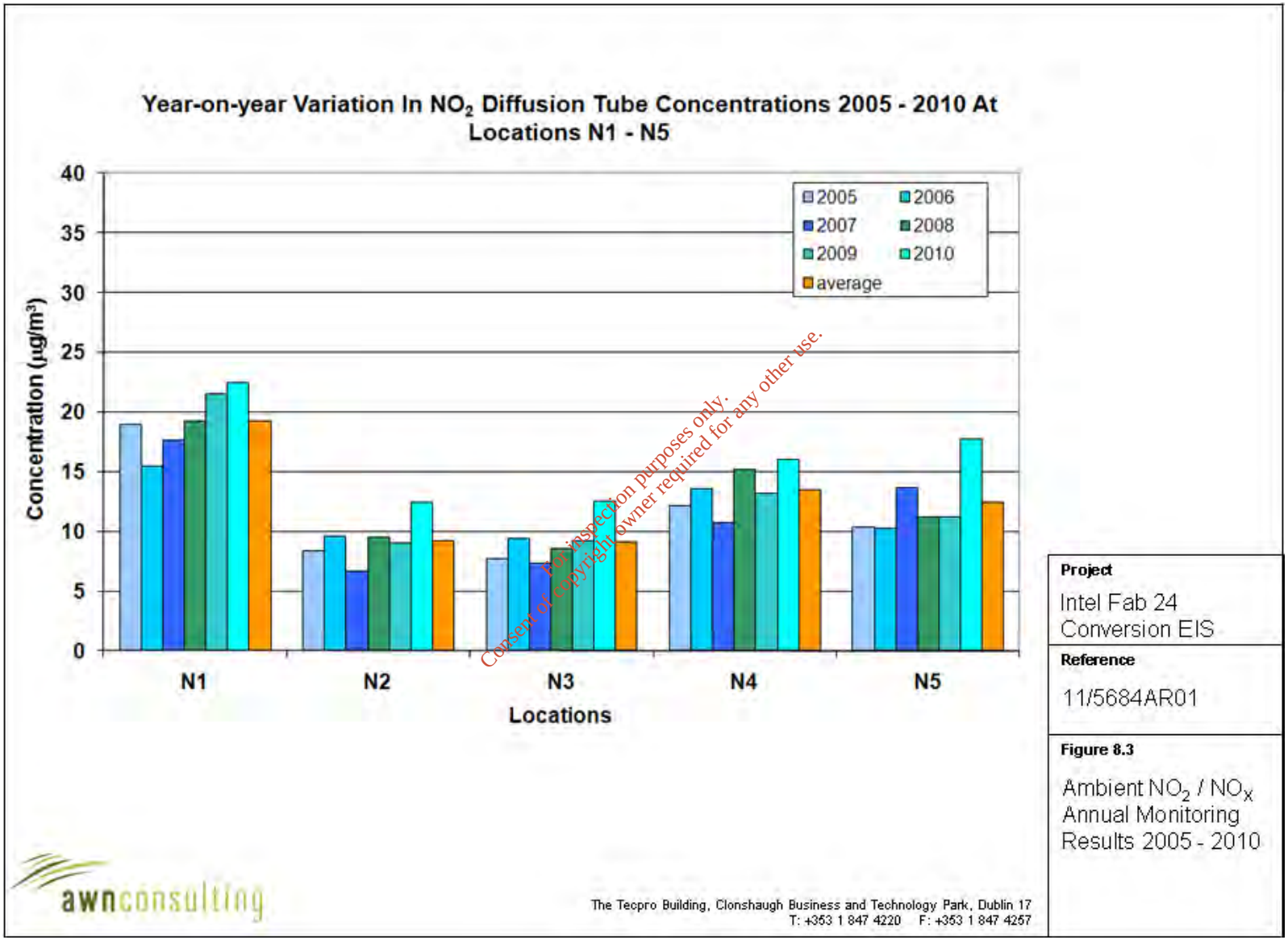

Figure 8.3 Ambient NO_2 / NO_X Annual Monitoring Results 2005 - 2010

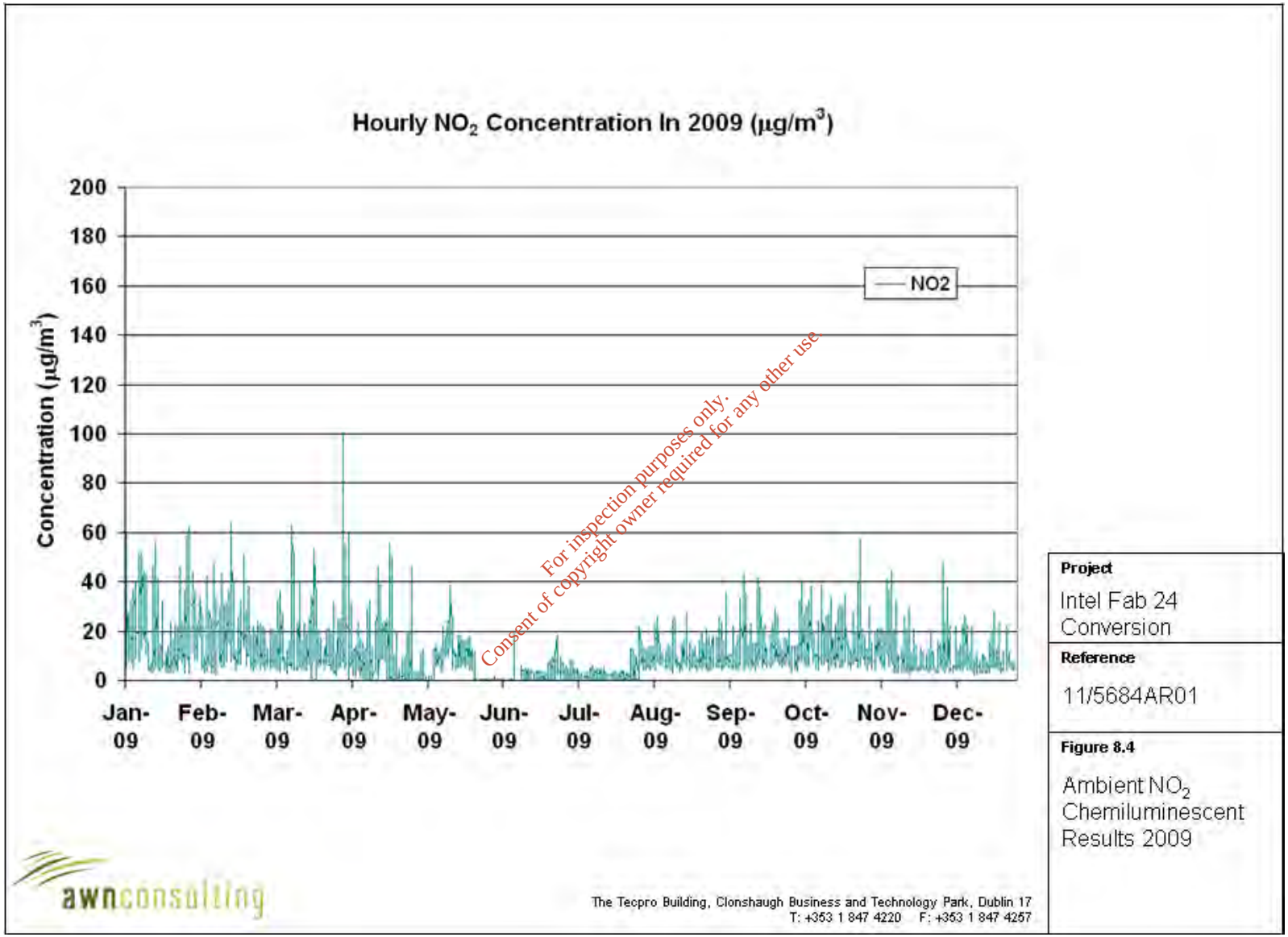

Figure 8.4 Ambient NO_2 / Chemiluminescent Results 2009

8.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

8.3.1 CONSTRUCTION PHASE

There is the potential for a number of emissions to the atmosphere during the construction of the proposed development. In particular, the construction activities may generate quantities of dust in the immediate region of the construction facility and along the route of the haulage trucks. Construction vehicles, generators etc., will also give rise to some exhaust emissions.

8.3.2 OPERATIONAL PHASE

The proposed FAB 24C development will have associated new air emissions sources. These new air emissions sources have been modelled and compared to the existing do nothing scenario. As Intel Ireland Ltd are currently undertaking an IPPC review of the site's existing licence, two no-nothing scenarios and one do-something scenario were investigated as outlined below.

Do Nothing Scenario 1
The do nothing scenario 1 is based on the following assumptions:

- Current IPPC emission limit values for all pollutants
- All stacks onsite which have received planning permission already but which are not in the current IPPC licence
- Licenced FAB 24-3 emissions points although this FAB has not been built.

Do Nothing Scenario 2
The do nothing scenario 2 is based on the following assumptions:

- Proposed IPPC emission limit values for all pollutants which include in some cases higher emission concentrations and volume flows
- All stacks onsite which are included in the IPPC licence review with the exception of the stacks which form part of the FAB 24C planning application
- FAB 24-3 emissions points are not include as these emission points will be withdrawn as part of the IPPC Licence Review.

Do Something
The do something scenario is based on the following assumptions:

- Proposed IPPC emission limit values for all pollutants which include in some cases higher emission concentrations and volume flows
- All stacks onsite which are included in the IPPC licence review including the stacks which form part of the FAB 24C planning application
- FAB 24-3 emissions points are not include as these emission points will be withdrawn as part of the IPPC Licence Review.

8.4 PREDICTED IMPACT OF THE PROPOSED DEVELOPMENT

8.4.1 CONSTRUCTION PHASE

The greatest potential impact on air quality during the construction phase of the Proposed Development is from construction dust emissions and the potential for nuisance dust. While construction dust tends to be deposited within 200m of a construction site, the majority of the deposition occurs within the first 50m. Most importantly, if the dust minimisation measures specified in Section 8.5.1 of this chapter are implemented, fugitive emissions of dust from the site will be insignificant and pose no nuisance at nearby receptors.

Due to the size and nature of the construction activities, CO_2 and N_2O emissions during construction will have a negligible impact on climate.

8.4.2 OPERATIONAL PHASE

The proposed FAB 24C development will have associated new air emissions sources as outlined an Appendix to this Chapter of the EIS (Appendix 8.3). These new air emissions sources have been modelled and compared to the existing do nothing scenario. As Intel Ireland Ltd are currently undertaking an IPPC review of the site's existing licence, two do-nothing scenarios were investigated as outlined in Section 8.3.2.

Volatile Organic Compounds (VOC)

As part of the proposed FAB 24C development, Intel Ireland Ltd has installed or is proposing to install a Rotor Concentrator/Thermal Oxidiser (RCTO) abatement system to treat process volatile organic compound (VOC) gas streams in both FAB 24 and FAB 24-2. FAB 10 and FAB 14 RCTOs have previously received planning permission for similar systems. Each RCTO system comprises a twin drum, rotary zeolite adsorption system to concentrate the VOC stream combined with a thermal oxidiser to destruct the VOC and convert them to mainly gaseous water and carbon dioxide products. When built there will be separate RCTO systems installed in each FAB as follows:-

- FAB 10
- FAB 14
- FAB 24
- FAB 24-2

FAB 14 and FAB 24-2 will contain an RCTO system consisting of three individual RCTO units. Each unit will connect to a separate oxidiser stack and hence there will be three oxidiser stacks associated with each FAB. In relation to FAB 24 there will be four RCTO units with one oxidiser stack associated with each RCTO unit operating in a 3 duty, 1 standby arrangement which will mean that only three of the four oxidiser stacks will be operating at any one time. In relation to FAB 10, there will be three RCTO units with one oxidiser stack associated with each RCTO unit operating in a 2 duty, 1 standby arrangement which will mean that only two of the three oxidiser stacks will be operating at any one time. In relation to FAB 14, FAB 24 and FAB 24-2 there will also be four concentrator stacks associated with each RCTO system, however, it should be noted that these will operate in a 3 duty, 1 standby arrangement which will mean that only three concentrator stacks will be operating at any one time. In relation to FAB 10, there will be one concentrator stack only.

Source Information

Source information including emission release heights, volume flows, locations and stack diameters has been summarised in an Appendix to this Chapter of the EIS (Appendix 8.1, Table A8.1).

The solvent stack emissions have been predicted from a volatile organic compound model developed by Intel. The emission concentrations have subsequently been modelled at the maximum flow rate. The percentage of the emissions, from FAB 10, FAB 14, FAB 24 and FAB 24-2 attributed to each TA Luft Class have been summarised in **Table 8.7**.

TA Luft Organic Class	Total Site Emissions
Class I	1.8
Class II	6.2
Class III	92.1

Table 8.7 Percentage Contribution of Each TA Luft Class Towards Emissions from Each FAB

The source information for each scenario has been summarised in **Table 8.8.**

Model Scenario	No of Stacks Emitting Organics					Flow Rate	Emission Concentration	Total Organic Emission Rate (g/sec)			
	FAB 10	FAB 14	FAB 24	FAB 24-2	FAB 24-3			Class I	Class II	Class III	Total
VOC – Do Nothing Scenario 1	6	9	4	-	6	Maximum	IPPC Licence Limit	0.75	2.6	4.9	8.3
VOC - Do Nothing Scenario 2	4	6	3	-	-	Maximum	IPPC Licence Limit	0.26	0.86	2.0	3.1
VOC - Do Something	4	6	6	6	-	Maximum	IPPC Licence Limit	0.62	2.2	6.9	4.0

Table 8.8 Summary of Source Information

Comparison with Standards

Emissions of Volatile Organic Compounds from Organic Solvent Regulations (2002) (SI No. 543 of 2002) outlines appropriate mass emission limits of volatile organic compounds from a range of industries. However, no statutory air quality standards for the individual organic compounds exist in Irish legislation. In the absence of statutory standards, it is common practice to reference other suitable authorities such as the World Health Organisation (WHO) or derive an ambient air quality guideline from occupational exposure limits (OEL).

Although the WHO has ambient air quality guidelines for a small range of volatile organic compounds, guidance has been issued by the UK Environment Agency entitled "IPPC Environmental Assessment and Appraisal of BAT" (Environment Agency, 2003) for an extensive range of organic compounds. The guidance outlines the approach for deriving both short-term and long-term environmental assessment levels (EAL). In relation to the long-term (annual) EAL, this can be derived by applying a factor of 100 to the 8-hour OEL. The factor of 100 allows for both the greater period of exposure and the greater sensitivity of the general population. For short-term (1-hour) exposure, the EAL is derived by applying a factor of 10 to the short term exposure limit (STEL). In this case, only the sensitivity of the general population needs be taken into account as there is no need for additional safety factors in terms of the period of exposure. Where STELs are not listed then a value of 3 times the 8-hour time weighted average occupational exposure limit may be used. No occupational exposure standards can be identified for certain compounds.

VOC Modelling Results

Modelling was carried out for the scenario described in Table 8.7. The predicted ground level concentrations (GLC) for each TA Luft organic class and selected VOC compounds have been predicted beyond the site boundary. The highest one-hour average GLC has been predicted for direct comparison with the derived ambient air quality guidelines. The highest 98th percentile and 99th percentile concentrations have also been predicted. This is the concentration that is not exceeded for 98 and 99 percent of the time respectively. Individual compounds have been selected on the basis of those with environmental significance (based on the compound's EAL).

Operating at the Regulatory Limits

Table 8.9 details the highest one hour GLCs predicted for the three emission scenarios. The table illustrates the predicted GLCs with all solvent stacks emitting the maximum concentration permitted for each TA-Luft Class. The results have also been compared against the appropriate UK environmental assessment level for each compound.

The 98th and 99th percentile concentrations for Class I - III are reported in Table 8.9. The GLCs have been summarised with concentrations reported for Class I - III as a whole as opposed to individual compounds.

Table 8.10 illustrates that low GLCs are predicted even when the maximum concentration of Class III compounds is emitted from all the solvent stacks on-site for all three scenarios.

Overall, the results show that, even when all the stacks are emitting Class III compounds at the maximum IPPC Licence limits from the whole site, including those associated with the FAB 24C, the concentrations will be low in comparison to the ambient air quality guidelines for each individual compound. Under these circumstances, the highest contribution towards any given hourly average EAL is approximately 2.6% for PGMEA. The impact of the development can be determined by comparing the do nothing and do something scenarios. In relation to PGMEA, the impact of the development is no greater than 0.5% of the limit value and thus, based on the criteria outlined in Tables 8.2 and 8.3, the impact of the development in terms of VOC emissions is negligible as shown in Figure 8.5.

Concentration Contours

The geographical variation in the maximum 1-hour PGMEA ground level concentration beyond the site boundary is illustrated as a concentration contour in **Figure 8.6** for the Do Something scenario.

Scenario / Model Year	Compound	TA-Luft Class	Long-Term EAL ($\mu g/m^3$)	Annual Concentration ($\mu g/m^3$)	Short-Term EAL ($\mu g/m^3$)	Highest 1-Hour Concentration ($\mu g/m^3$)	Percentage Of EAL
Do Nothing Scenario 1 / 2006	PGMEA	III	540	6.2	3,600	83.6	2.3%
Do Nothing Scenario 1 / 2007	PGMEA	III	540	6.7	3,600	86.2	2.4%
Do Nothing Scenario 1 / 2008	PGMEA	III	540	6.1	3,600	87.0	2.4%
Do Nothing Scenario 1 / 2009	PGMEA	III	540	6.2	3,600	97.8	2.7%
Do Nothing Scenario 1 / 2010	PGMEA	III	540	6.1	3,600	82.3	2.3%
Do Nothing Scenario 2 / 2006	PGMEA	III	540	4.2	3,600	74.1	2.1%
Do Nothing Scenario 2 / 2007	PGMEA	III	540	4.5	3,600	76.2	2.1%
Do Nothing Scenario 2 / 2008	PGMEA	III	540	4.2	3,600	73.4	2.0%
Do Nothing Scenario 2 / 2009	PGMEA	III	540	4.3	3,600	75.2	2.1%
Do Nothing Scenario 2 / 2010	PGMEA	III	540	4.0	3,600	74.7	2.1%
Do Something / 2006	PGMEA	III	540	5.5	3,600	88.4	2.5%
Do Something / 2007	PGMEA	III	540	5.8	3,600	93.1	2.6%
Do Something / 2008	PGMEA	III	540	5.4	3,600	88.8	2.5%
Do Something / 2009	PGMEA	III	540	5.5	3,600	92.2	2.6%
Do Something / 2010	PGMEA	III	540	5.3	3,600	91.8	2.6%

Table 8.9 Worst-Case Predicted Hourly Average Organic Compound GLCs with Each Stack Emitting Organics at the Maximum Regulatory Limit

Scenario / Model Year	Compound	TA Luft Class III		TA Luft Class II		TA Luft Class I	
		Highest 98th Percentile Concentration ($\mu g/m^3$)	Highest 99th Percentile Concentration ($\mu g/m^3$)	Highest 98th Percentile Concentration ($\mu g/m^3$)	Highest 99th Percentile Concentration ($\mu g/m^3$)	Highest 98th Percentile Concentration ($\mu g/m^3$)	Highest 99th Percentile Concentration ($\mu g/m^3$)
Do Nothing Scenario 1 / 2006	VOC	83.4	109.7	25.6	33.0	7.3	9.6
Do Nothing Scenario 1 / 2007	VOC	84.6	115.6	25.8	35.3	7.4	10.1
Do Nothing Scenario 1 / 2008	VOC	79.9	95.6	24.2	29.5	7.0	8.4
Do Nothing Scenario 1 / 2009	VOC	84.8	99.3	25.7	30.6	7.4	8.8
Do Nothing Scenario 1 / 2010	VOC	89.1	110.2	27.1	33.9	7.8	9.7
Do Nothing Scenario 2 / 2006	VOC	61.5	82.5	19.0	24.9	5.4	7.2
Do Nothing Scenario 2 / 2007	VOC	68	99.3	20.5	31.0	5.8	8.8
Do Nothing Scenario 2 / 2008	VOC	59	77.7	18.7	24.3	5.2	6.9
Do Nothing Scenario 2 / 2009	VOC	61.9	77.9	19.8	23.4	5.5	6.8
Do Nothing Scenario 2 / 2010	VOC	74.5	96.3	22.5	29.4	6.5	8.5
Do Something / 2006	VOC	82.5	112.8	26.5	36.7	7.3	10.2
Do Something / 2007	VOC	83.6	123.0	26.6	39.9	7.4	11.1
Do Something / 2008	VOC	75.5	98.6	24.4	31.7	6.7	8.8
Do Something / 2009	VOC	79.1	101.1	25.6	32.8	7.0	9.1
Do Something / 2010	VOC	97.3	122.5	31.3	39.4	8.7	10.9

Table 8.10 Predicted Class I - III 98th and 99th*tile Organic Compound GLCs With Each Stack Emitting Organics at the Maximum Regulatory Limit

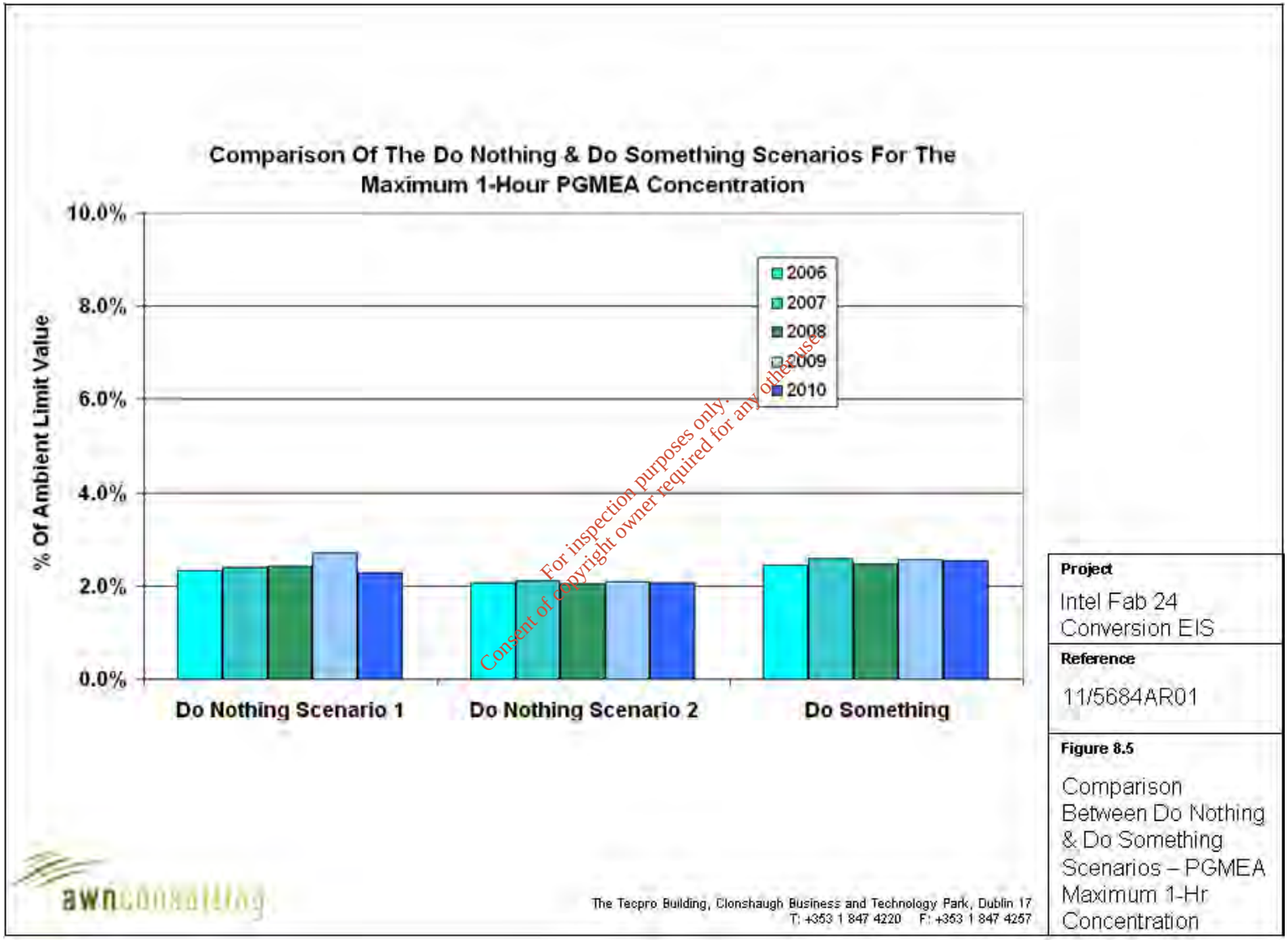

Figure 8.5 Comparison: Do Nothing & Do Something Scenarios PGMEA Max 1hr Concentration

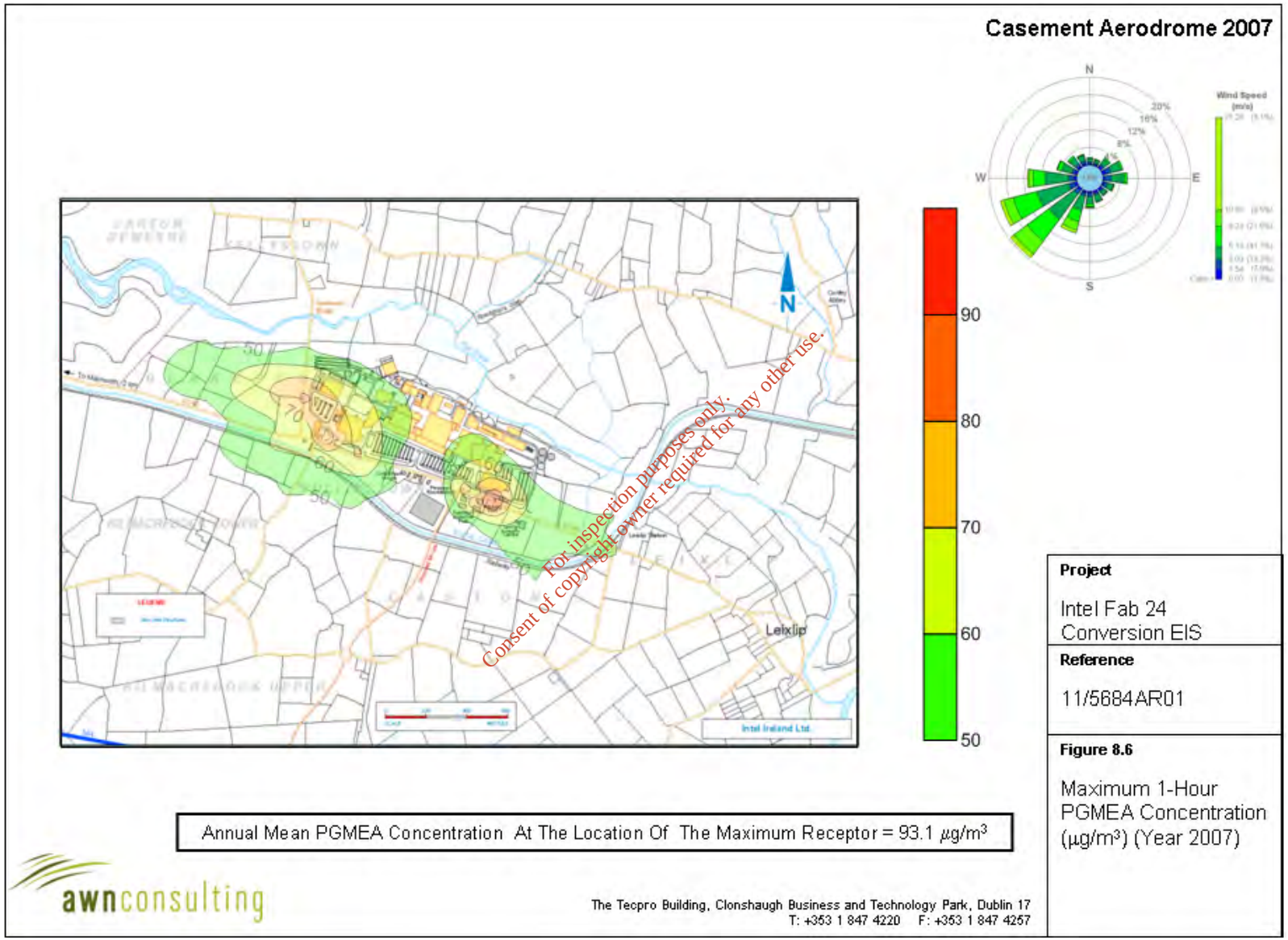

Figure 8.6 Max 1 hr PGMEA Concentration (µg/m³) (Year 2007)

Ammonia

For the Do Something scenario, there will be thirteen ammonia emissions points at Intel Ireland Ltd. A220 and A247 are both currently located in FAB 24 whilst planning permission has been received for four new ammonia emission points in FAB 14 on the basis of three duty / one standby and a fourth ammonia emission point (known as the "Waste Ammonia Removal System" exhaust).

As part of this application, two new additional ammonia emission points will be located in FAB 24 on the basis of three duty / one standby. Additionally, four new ammonia emission points will be located in FAB 24-2 on the basis of three duty / one standby. Thus, at any one time, no more than ten emission point will be in operation for the Do Something Scenario

Source Information

Source information including emission release heights, volume flows, locations and stack diameters has been summarised in an Appendix to this Chapter of the EIS (Appendix 8.1, Table A8.2).

The emission of NH3 from the site, for all three scenarios, has been modelled at 30 mg/Nm3 concentration for each of the ten existing / proposed ammonia stacks operating.

Emissions have been modelled with the scrubbers running at their maximum rated flow rate though the scrubber units would run at the maximum flow on very infrequent occasion. The source information for each modelled scenario has been summarised in **Table 8.11**.

Model Scenario	No of Stacks Emitting NH_3					Flow Rate	Emission Concentration	Total Ammonia Emission Rate (g/sec)
	FAB 10	FAB 14	FAB 24	FAB 24-2	FAB 24-3			
NH_3 – Do Nothing Scenario 1	-	3	2	-	2	Maximum	All stacks at 30 mg/m^3	1.8
NH_3 - Do Nothing Scenario 2	-	3	2	-	-	Maximum	All stacks at 30 mg/m^3	1.4
NH_3 - Do Something	-	3	3	4	-	Maximum	All stacks at 30 mg/m^3	2.7

Table 8.11 Summary of Source Information

Comparison With Standards

Predicted ground level concentrations have been compared against relevant international health and vegetative standards.

An ambient air quality limit for ammonia of 300 $\mu g/m^3$ has been defined in the Danish Environmental Guidelines (2002) Guidelines For Air Emission Regulation "C" guidelines. The standard is expressed as a 99th percentile. Concentrations must, therefore, be below the limit concentration for 99 percent of the time. The air quality criteria for NH_3 can therefore be summarised as:

Ambient NH_3 not to exceed 300 $\mu g/m^3$ for 99% of the time in any given year (as a one hour average).

The WHO has also set a critical level for the protection of vegetation and ecosystems as outlined in **Table 8.12**.

Pollutant	Regulation	Limit Type	Value
Ammonia	WHO (1994)	Hourly	3300 $\mu g/m^3$
		Daily	270 $\mu g/m^3$
		Monthly	23 $\mu g/m^3$
		Annual	80 $\mu g/m^3$

Table 8.12 WHO (1994) Working Group on Ecological Effects

NH_3 Modelling Results

Modelling was carried out for the scenarios described in Table 8.10. The highest predicted ammonia ground level concentrations (GLC) beyond the site boundary have been predicted for that scenario.

Table 8.13 details the GLC based on the three emission scenarios. For direct comparison with international standards, the hourly, 99th percentile of one-hour concentrations, daily and annual averages have been calculated for the location with the highest predicted concentration. All other locations beyond the site boundary will be lower than the reported values.

Predicted NH_3 concentrations under maximum operational limits of the plant are below the relevant standards. Ambient levels peak at less than 16% of the limit values for the Do Something scenario. The concentrations listed in Table 8.12 are for the maximum concentrations to be predicted at any location beyond the site boundary. All other locations are below these values.

The impact of the development can be determined by comparing the do nothing and do something scenarios. In relation to ammonia, the impact of the development is no greater than 4.1% of the limit value and thus, based on the criteria outlined in Table 8.2 and 8.3, the impact of the development in terms of ammonia emissions is negligible as shown in Figure 8.7.

Concentration Contours

The geographical variation in the 99th%ile of mean one-hour NH_3 ground level concentrations beyond the site boundary is illustrated as a concentration contour in Figure 8.8 for the Do Something scenario.

Model Scenario / Year	No of Exhaust Units Emitting NH_3					Flow Rate	Emission Concentration	99th %ile of 1-hr(1)	1-Hr(2)	24-Hr(2)	Annual(2)
	FAB 10	FAB 14	FAB 24	FAB 24-2	FAB 24-3						
Do Nothing Scenario 1 / 2006	-	3	2	-	2	Maximum	IPPC Limit	37.1	89.1	22.3	4.4
Do Nothing Scenario 1 / 2007	-	3	2	-	2	Maximum	IPPC Limit	35.9	87.1	22.9	4.4
Do Nothing Scenario 1 / 2008	-	3	2	-	2	Maximum	IPPC Limit	33.5	85.0	17.3	4.2
Do Nothing Scenario 1 / 2009	-	3	2	-	2	Maximum	IPPC Limit	35.5	91.2	20.6	4.4
Do Nothing Scenario 1 / 2010	-	3	2	-	2	Maximum	IPPC Limit	37.7	90.2	25.9	4.1
Do Nothing Scenario 2 / 2006	-	3	2	-	-	Maximum	IPPC Limit	37.1	89.1	21.3	4.1
Do Nothing Scenario 2 / 2007	-	3	2	-	-	Maximum	IPPC Limit	35.0	87.1	22.6	4.0
Do Nothing Scenario 2 / 2008	-	3	2	-	-	Maximum	IPPC Limit	33.5	85.0	16.6	4.0
Do Nothing Scenario 2 / 2009	-	3	2	-	-	Maximum	IPPC Limit	35.5	91.2	20.4	4.2
Do Nothing Scenario 2 / 2010	-	3	2	-	-	Maximum	IPPC Limit	37.7	90.2	23.6	3.8
Do Something / 2006	-	3	3	4	-	Maximum	IPPC Limit	47.4	96.0	25.6	8.0
Do Something / 2007	-	3	3	4	-	Maximum	IPPC Limit	47.4	97.4	27.1	8.4
Do Something / 2008	-	3	3	4	-	Maximum	IPPC Limit	41.6	99.7	26.5	8.5
Do Something / 2009	-	3	3	4	-	Maximum	IPPC Limit	42.9	97.5	25.3	8.4
Do Something / 2010	-	3	3	4	-	Maximum	IPPC Limit	46.1	94.1	31.7	7.8
Relevant International Standard								300	3300	270	80

(1) Danish "C-value".
(2) WHO Critical Levels for Protection of Vegetation and Ecosystems

Table 8.13 Predicted NH3 Concentrations ($\mu g/m^3$)

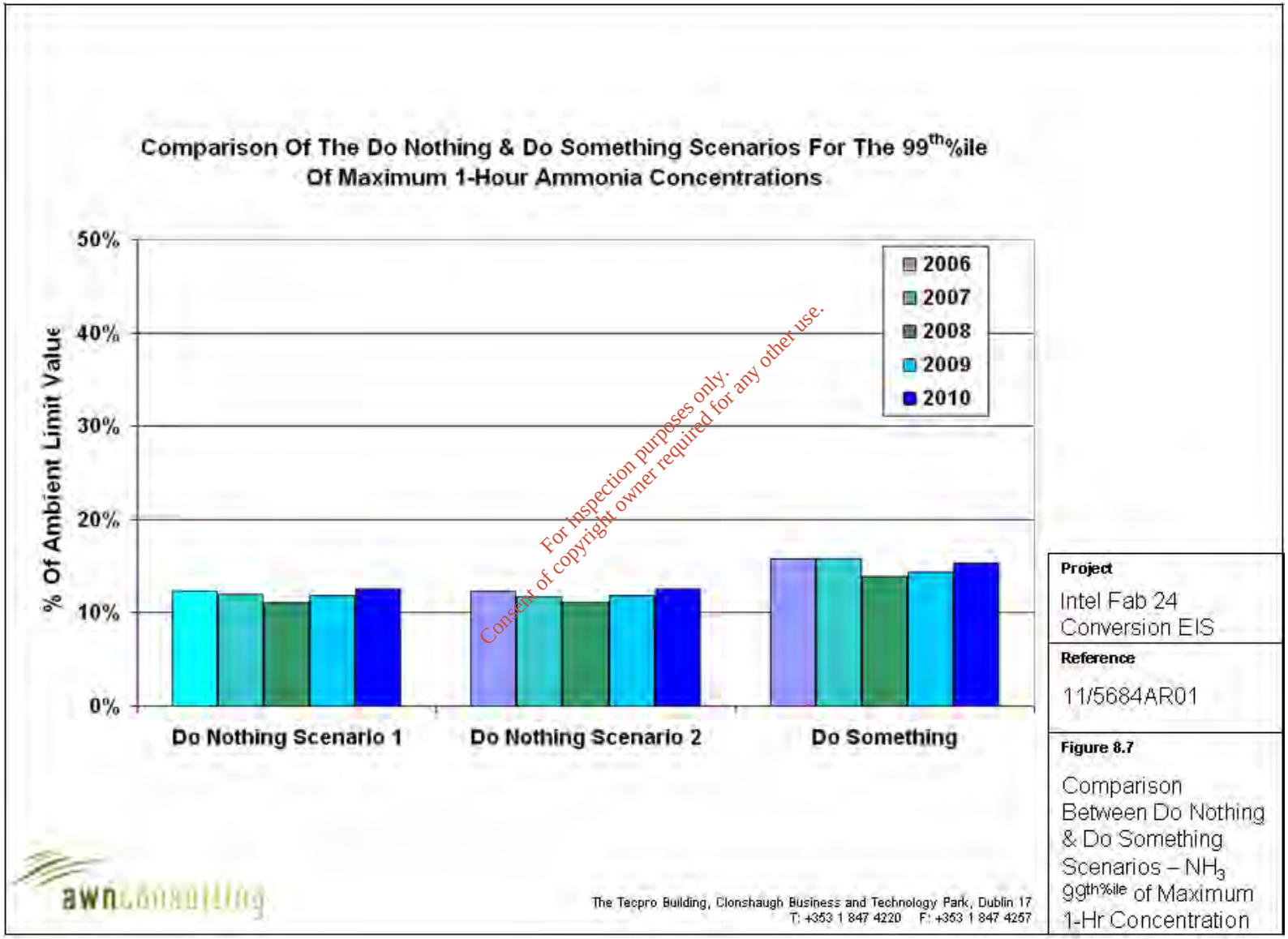

Figure 8.7 Comparison: Do Nothing & Do Something NH_3 99th$^{\%ile}$ of Max 1 hr Concentration

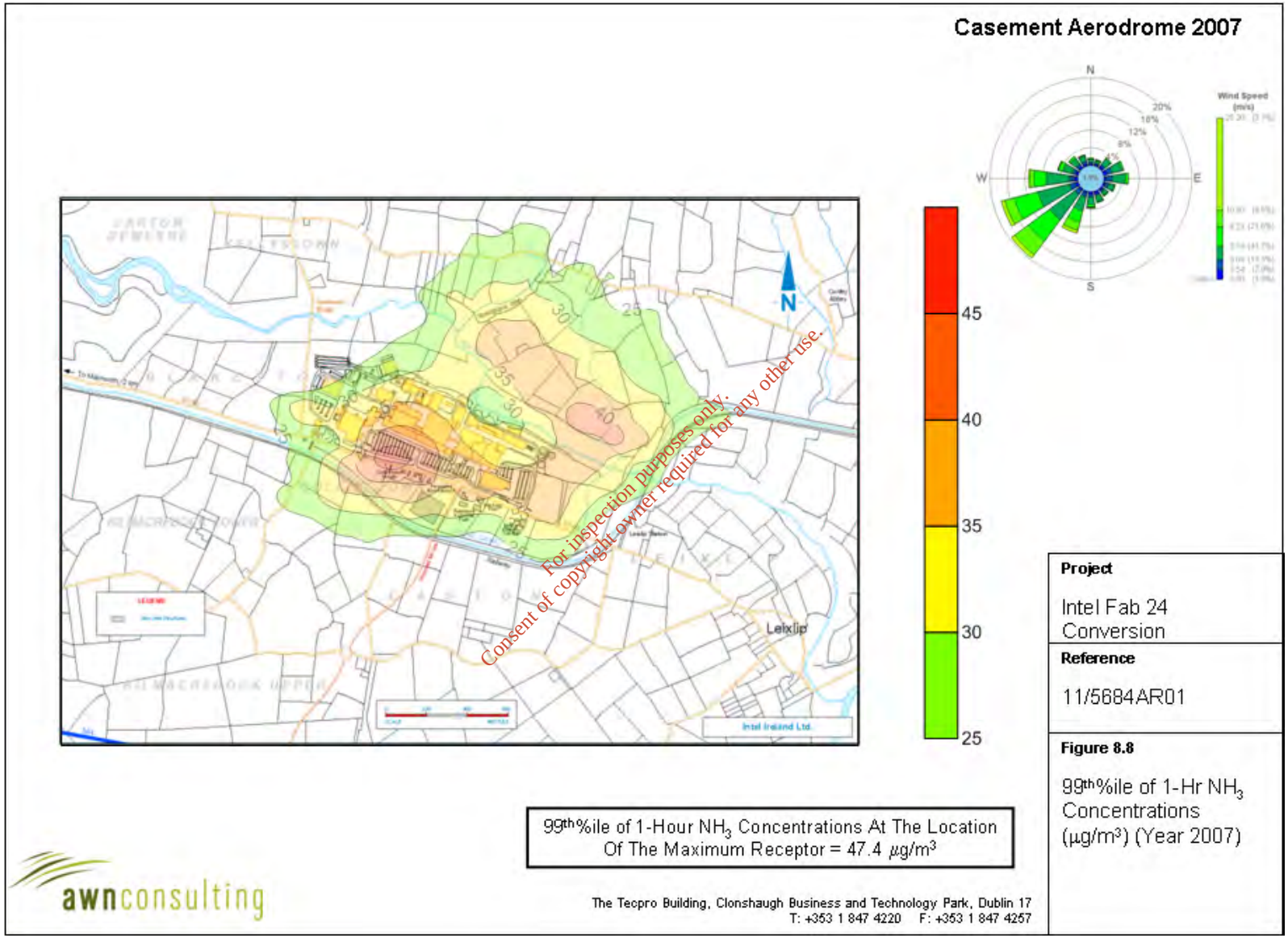

Figure 8.8 99th$^{\%ile}$ of 1 hr NH_3 Concentrations ($\mu g/m^3$) (Year 2007)

Nitrogen Dioxide

The primary releases of NO_2 emissions from Intel occur from the boiler stacks. NO_2 is released from up to nine stacks from the existing IFO (five boiler stacks on FAB 10 and FAB 14), from four smaller boilers in IR1 and IR3 and from seven additional boilers in FAB 24/24-2. No new boilers will be installed as part of the FAB 24C.

In addition, as part of the proposed FAB 24C development, Intel Ireland Ltd has installed or is proposing to install a Rotor Concentrator/Thermal Oxidiser (RCTO) abatement system to treat process volatile organic compound (VOC) gas streams in both FAB 24 and FAB 24-2. FAB 10 and FAB 14 RCTOs have previously received planning permission for similar systems. Each RCTO system comprises a twin drum, rotary zeolite adsorption system to concentrate the VOC stream combined with a thermal oxidiser to destruct the VOC and convert them to gaseous water and carbon dioxide products. The thermal oxidisers also have associated NO_2 emissions when in operation. When built, there will be separate RCTO systems installed in each FAB as follows:-

- FAB 10
- FAB 14
- FAB 24
- FAB 24-2

FAB 14 and FAB 24-2 will contain an RCTO system consisting of three individual RCTO units. Each unit will connect to a separate oxidiser stack and hence there will be three oxidiser stacks associated with each FAB. In relation to FAB 24, there will be four RCTO units with one oxidiser stack associated with each RCTO unit operating in a 3 duty, 1 standby arrangement which will mean that only three of the four oxidiser stacks will be operating at any one time. In relation to FAB 10, there will be three RCTO units with one oxidiser stack associated with each RCTO unit operating in a 2 duty, 1 standby arrangement which will mean that only two of the three oxidiser stacks will be operating at any one time. In relation to FAB 14, FAB 24 and FAB 24-2, there will also be four concentrator stacks associated with each RCTO system, however, it should be noted that these will operate in a 3 duty, 1 standby arrangement which will mean that only three concentrator stacks will be operating at any one time. In relation to FAB 10, there will be one concentrator stack only.

Source Information

Source information including emission release heights, volume flows, locations and stack diameters has been summarised in an Appendix to this chapter of the EIS (Appendix 8.1, Table A8.3)

Modelling of Nitrogen Dioxide

Nitrogen oxides (NO_X), containing both nitrogen oxide (NO) and nitrogen dioxide (NO_2) are emitted from the various combustion processes on-site, although it is the latter which is considered the more harmful to human health. These combustion processes lead to emissions which are mainly in the form of nitrogen oxide (NO) (typically 95%) with small amounts of the more harmful nitrogen dioxide.

NO_2 has been modelled following the approach outlined by the USEPA for assessing the impact of NO_X from point sources. The approach involves assessing the air quality impact through a three tiered screening technique. The initial analysis, termed the Tier 1 approach, assumes a worst-case scenario that there is total conversion of NO_X to NO_2. The guidance indicates that if this worst-case assumption leads to an exceedance of the appropriate limit value, the user should proceed to the next Tier. Tier 2 is appropriate for estimating the annual average NO_2 concentration, though not for estimating the maximum one-hour limit value. The Tier 2 approach indicates that the annual average concentration should be derived from an empirically derived NO_2/NO_X ratio. The guidance suggests that the NO_2/NO_X ratio should be based on data representative of area wide quasi-equilibrium conditions. In order to determine the maximum one-hour value, the Tier 3 approach is recommended by the USEPA. The Tier 3 approach involves the application of a detailed screening method on a case-by-case basis. The suggested methodologies include the ozone-limiting method or a site-specific NO_2/NO_X ratio. The site-specific method requires ambient monitors to be sited to obtain the NO_2 and NO_X concentrations under quasi-equilibrium conditions. In the current assessment, a site-specific ratio has been developed using data from the continuous monitoring station operated by Intel. The monitoring station is located near the northern boundary of the site. This location is also near the location of the maximum predicted concentration. Thus, the ratio derived from the monitoring data should give a good reflection of the actual NO_2/NO_X ratio at the location of the maximum concentration.

Ambient Ground Level Concentrations (GLCs) of Nitrogen Dioxide have been predicted for the following scenarios in **Table 8.14**.

Model Scenario	No of Boilers & Oxidisers Units emitting NO_2						Flow Rate	Emission Concentration	Total Emission Rate (g/sec)
	IR1 & IR 3	FAB 10	FAB 14	FAB 24	FAB 24-2	FAB 24-3			NO_x (as NO_2)
NO_2 – Do Nothing Scenario 1	4	8	6	8	2	9	Maximum	IPPC Limit	10.9
NO_2 - Do Nothing Scenario 2	4	8	7	8	2	-	Maximum	IPPC Limit	8.1
NO_2 - Do Something	4	8	7	8	5	-	Maximum	IPPC Limit	9.0

Table 8.14 Summary of Source Information

Comparison With Standards And Guidelines

The relevant air quality standards for Nitrogen Dioxide have been detailed in Table 8.14. In this report, the ambient air concentrations have been referenced to the provisions of Council Directive 2008/50/EC on ambient air quality and clearer air for Europe which was transposed into Irish law by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011).

Pollutant	Regulation	Limit Type	Margin of Tolerance	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	40% until 2003 reducing linearly to 0% by 2010	200 µg/m^3 NO_2
		Annual limit for protection of human health	40% until 2003 reducing linearly to 0% by 2010	40 µg/m^3 NO_2
		Annual limit for protection of vegetation	None	30 µg/m^3 NO + NO_2

Table 8.15 EU Ambient Air Standards - Council Directive 2008/50/EC

Modelling Results

Modelling was carried out for the scenarios described in **Table 8.14**.

Table 8.16 detail the predicted NO_2 GLC for these scenarios.

Predicted NO_2 concentrations under maximum operational limits of the plant are below the relevant standards. Ambient levels peak at less than 71% of the limit values for the Do Something scenario. The concentrations listed in **Table 8.16** are for the maximum concentrations to be predicted at any location beyond the site boundary. All other locations are below these values.

The impact of the development can be determined by comparing the Do Nothing and Do Something scenarios. In relation to NO_2, the impact of the development is no greater than 1.8% of the limit value and thus, based on the criteria outlined in **Tables 8.2 and 8.3**, the impact of the development in terms of NO_2 emissions is negligible as shown in Figure 8.9.

Concentration Contours

The geographical variations in the 99.8th%ile of mean one-hour NO_2 ground level concentrations beyond the site boundary are illustrated as concentration contours in **Figure 8.10** for all FABs continually in operation. The geographical variations in the annual mean NO_2 ground level concentration beyond the site boundary are illustrated as concentration contours in **Figure 8.11** for all FABs continually in operation.

Model Scenario / Year	No of Boilers & Oxidisers Emitting NO_2						Flow Rate	Emission Concentration	99.8th percentile GLC of NO_2 hourly values	Annual NO_2 Mean
	IR1 & IR3	FAB 10	FAB 14	FAB 24	FAB 24-2	FAB 24-3			Tier 3 NO_2 (1,3)	Tier 3 NO_2 (2,3)
Do Nothing Scenario 1 / 2006	4	8	6	8	2	9	Maximum	IPPC Limit	104.5	28.7
Do Nothing Scenario 1 / 2007	4	8	6	8	2	9	Maximum	IPPC Limit	108.3	29.4
Do Nothing Scenario 1 / 2008	4	8	6	8	2	9	Maximum	IPPC Limit	100.7	29.1
Do Nothing Scenario 1 / 2009	4	8	6	8	2	9	Maximum	IPPC Limit	103.8	29.1
Do Nothing Scenario 1 / 2010	4	8	6	8	2	9	Maximum	IPPC Limit	112.0	28.1
Do Nothing Scenario 2 / 2006	4	8	7	8	2	-	Maximum	IPPC Limit	102.3	27.0
Do Nothing Scenario 2 / 2007	4	8	7	8	2	-	Maximum	IPPC Limit	105.9	27.6
Do Nothing Scenario 2 / 2008	4	8	7	8	2	-	Maximum	IPPC Limit	99.0	27.4
Do Nothing Scenario 2 / 2009	4	8	7	8	2	-	Maximum	IPPC Limit	101.9	27.5
Do Nothing Scenario 2 / 2010	4	8	7	8	2	-	Maximum	IPPC Limit	109.9	26.4
Do Something / 2006	4	8	7	8	5	-	Maximum	IPPC Limit	104.6	27.7
Do Something / 2007	4	8	7	8	5	-	Maximum	IPPC Limit	108.3	28.3
Do Something / 2008	4	8	7	8	5	-	Maximum	IPPC Limit	101.0	28.1
Do Something / 2009	4	8	7	8	5	-	Maximum	IPPC Limit	103.5	28.2
Do Something / 2010	4	8	7	8	5	-	Maximum	IPPC Limit	112.0	27.0
Relevant International Standard									EU Limit : 200μg/m³	EU Limit: 40μg/m³

(1) Conversion factor, following guidance from USEPA (Tier 3 analysis), based on empirically derived site-specific maximum 1-hour value for NO_2 / NO_X of 0.25
(2) Conversion factor following guidance from USEPA (Tier 2 analysis, annual average) based on site-specific ratio of 0.60.
(3) Worst-case air modelling locations are to the north of the site (as shown in Figures 8.10 and 8.11) & thus background concentrations at these locations are not influenced by the traffic along the R148. Background concentrations at these locations are 10 μg/m³ for the annual mean and 20 μg/m³ for the maximum 1-hr concentration (as a 99.8th%ile).

Table 8.16 Predicted Nitrogen Dioxide (NO_2) Concentrations at the IPPC Licence Limit (including background) (μg/m³) Using Natural Gas

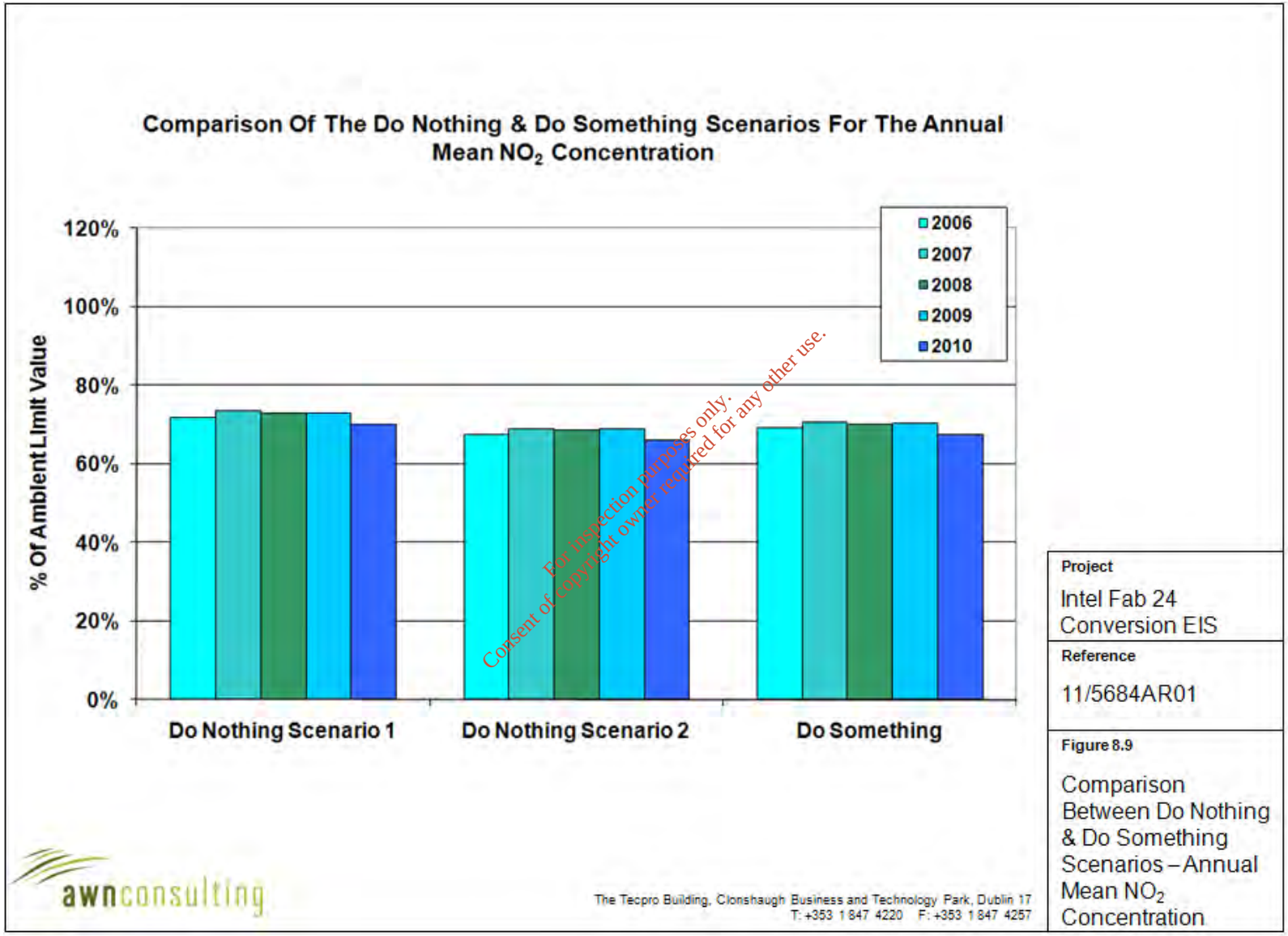

Figure 8.9 Comparison: Do Nothing & Do Something Scenarios Annual Mean No_2 Concentration

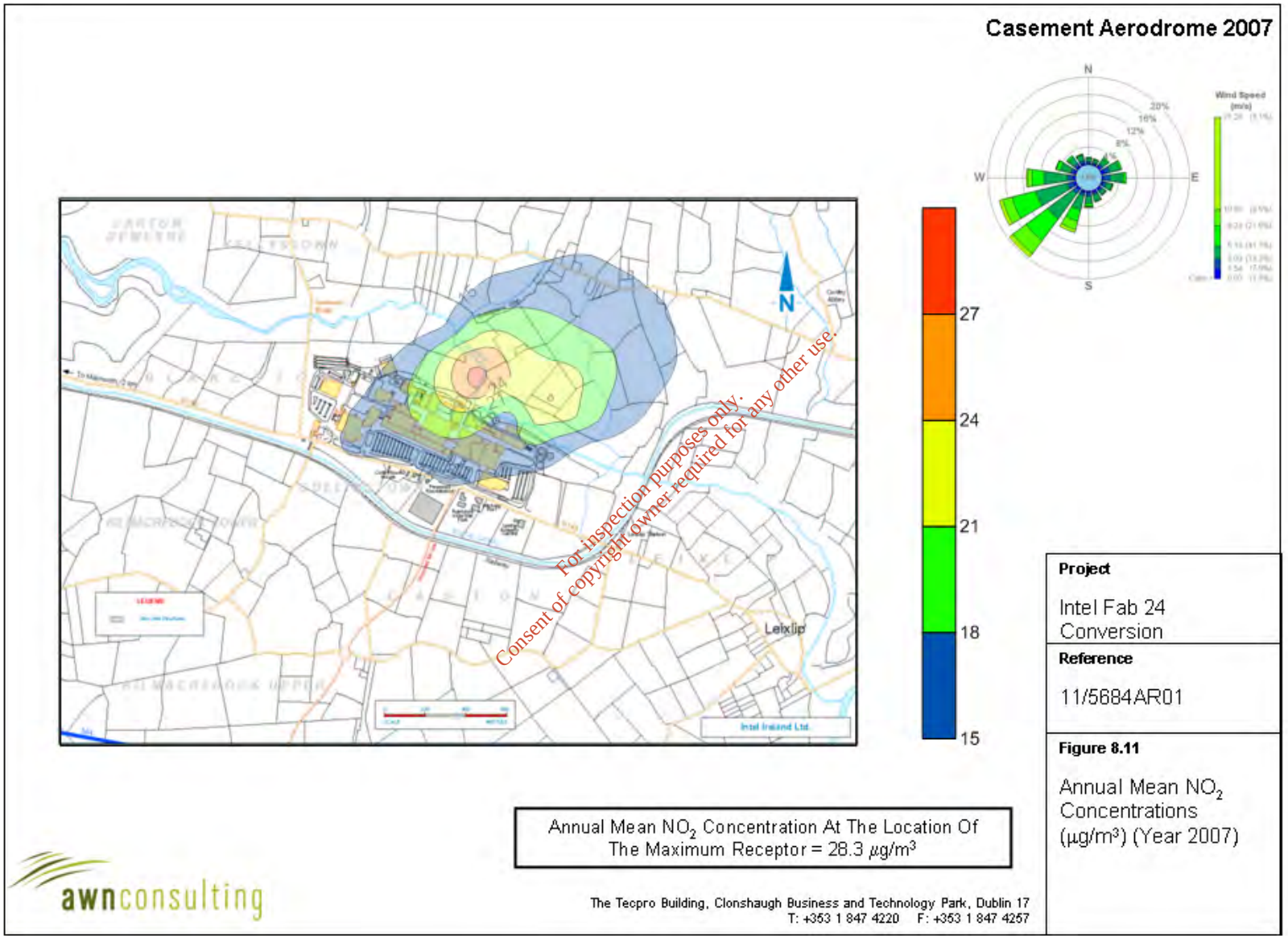

Figure 8.10 Annual Mean NO_2 Concentration ($\mu g/m^3$) (Year 2007)

Hydrogen Fluoride, Total Fluorides & Total Acids
No Hydrogen Fluoride (HF), Total Fluoride (TF) or Total Acids (TA) emissions are associated with the FAB 24C. However, as part of the FAB 24C, a new building referred to as the Air Treatment Building, will be constructed directly to the north of FAB 24-2. The presence of this building has the potential to indirectly affect the impact of the existing emissions of HF, TF and TA from both FAB 24-2 and the FAB 24 bridge. The indirect effect is due to possible changes to the building downwash which each of these stacks experience due to the introduction of a new building within the zone of influence of these stacks. In order to determine whether the Air Treatment Building leads to any change in the ground level concentration of these pollutants beyond the site boundary, air dispersion modelling was undertaken both before and after the installation of the building and the results compared. A review of the ground level concentration results for HF, TF and TA indicated that there were insignificant changes in the ground level concentrations for all pollutants and thus the construction of the Air Treatment Building leads to a negligible impact for HF, TF and TA.

8.5 MITIGATION MEASURES

In order to sufficiently ameliorate any potential negative impacts on the air environment, a schedule of measures has been formulated for both construction and operational phases associated with the proposed facility.

8.5.1 CONSTRUCTION PHASE

The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of dust produced will be deposited close to the generated source. A dust minimisation plan will be formulated for the construction phase of the project, as construction activities are likely to generate some dust emissions.

In order to ensure that no dust nuisance occurs, a series of measures will be implemented:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic only apart from the contractor's car park which will be hardcore only.
- Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site road, this will be 20 kph, and on hard surfaced roads as site management dictates.
- Vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust.
- Wheel washing facilities will be provided for vehicle exiting site in order to ensure that 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.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.
- At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Climate
Emissions of carbon dioxide will be mitigated by using efficient construction vehicles, appropriate scheduling of construction activities to minimise duration, the shutting off of equipment during periods of inactivity if they do occur and a transport management plan described within the transport section of the EIS. No additional mitigation measures are considered necessary.

8.5.2 DURING OPERATION

Air Quality
Additional abatement, treatment or recovery systems will be included in FAB 24C to ensure emissions to the environment are minimised. All systems are of proven design and represent BAT. The same monitoring and control philosophy will apply to the FAB 24C units as for existing units onsite. The systems include:

- Ammonia scrubbers to remove ammonia releases to air;
- VOC abatement using the latest technology of concentrator/ thermal oxidiser that has been demonstrated to reduce VOC emissions from the site to low levels;

All FABs are fitted with VOC abatement and the site is fully compliant with requirements of the Solvents Directive.

The combination of existing and new treatment systems along with material substitution and cleaner technology to minimise emissions at source, will ensure there are no residual impacts from releases to air from both the existing site and the FAB 24C.

Monitoring
Monitoring of emissions from the proposed FAB 24C will regularly be carried out to demonstrate compliance with IPPC licence conditions. This will include the measurement of VOCs, ammonia and combustion emissions from the RCTOs. The EPA will identify the monitoring requirements as part of a new licence application.

Climate
The major GHG emissions from Intel Ireland are associated with the combustion of fossil fuels in the medium pressure hot water boilers and the RCTOs. Natural Gas is the primary type of fossil fuel for the boilers and the only fuel used in the RCTOs. Natural Gas has the lowest greenhouse emissions of any fossil fuel.

Intel is the holder of a Green House Gas Permit (GHG-58-05) from the Irish EPA. Currently, Intel has an allocation to emit 43,627 tonnes CO_2 / annum over the period 2008 – 2012 under the EPA's National Allocation Plan (NAP). This plan was drawn up in accordance with the EU's Emissions Trading Scheme. Over the period 2008 – 2010, Intel Ireland has emitted 30,698, 31,655 and 32,895 tonnes CO_2 per annum respectively which equates to a saving of 35,633 tonnes CO_2 over the allocation for these three years.

Over the last 7 years, the RCTOs have generated approximately 5-8% of the CO_2 emissions from the site. Each RCTO Oxidiser has a burner with a rating of approximately 0.3MW (300kW) with either two or three RCTOs in operate on each system. Each of the 0.3 MW burners will produce about 520 tonnes CO_2 per year. For the current application, it is proposed to operate an additional six RCTOs which will equate to approximately 3,120 tonnes CO_2 per annum which is equivalent to 7% of the annual allocation. Based on the actual emissions in 2010, the additional increase in CO_2 emissions will still results in emission levels which are substantially lower than the annual allocation.

In addition, Intel has aggressively pursued energy conservation over many years and is certified to EN 16001, the European Energy Management Standard. These energy conservation projects are detailed in the AER on an annual basis.

The use of perfluorinated carbon (PFC) compounds is essential to the manufacture of high performance semiconductor products. These compounds tend to have relatively high global warming potentials. These compounds have no local environmental impact but they do contribute to climate change. Although the semiconductor manufacturing sector would not be considered a significant contributor to global warming, Intel Ireland, in conjunction with the European semiconductor manufacturing sector, has long recognized the need to be proactive in addressing these emissions and in the 1990's, the sector agreed a voluntary commitment to reduce by 2010 its emissions of PFC by 10% below the 1995 emissions. Intel Ireland has played its part in these reductions and has made great strides in reducing both normalized and absolute emissions leading to a substantial fall in emissions over the last ten years. This reduction has been achieved through a number of measures such as the successful introduction of low-GWP alternatives into

the process, enhanced process control and abatement units associated with the process tools that remove PFC compounds before they are released to atmosphere. A post 2010 voluntary agreement is at an advanced state of preparation and will commit the industry to normalized emission reductions for the period 2010 to 2020. Intel is committed to having normalized emissions levels much lower than in the original 200mm factories (FAB 10 and FAB 14) but the absolute emissions will depend on production levels. Intel Ireland Ltd, in line with the objectives of the NCCS strategy, has been and will continue to actively investigate means of reducing the use of industrial gases in a bid to reduce emissions with global warming potential from the site. In an overall context, given that national emissions are in the order of 60 – 70 million tonnes of CO_{2eq} per annum, emissions of PFC from the facility are estimated to range from 0.15% to no more than 0.5% of the current national emissions total. This estimate is based upon projected production levels, product mixes and process specific emission profiles.

8.6 RESIDUAL IMPACT

Air Quality and Climate

No residual impacts in terms of air quality are anticipated. Residual impacts associated with climate include ongoing releases of emissions with global warming potential in common with all domestic, commercial and industrial combustion sources in Ireland including heating systems, vehicles and indirectly from the use of electricity. These will be minimised onsite wherever practical using measures described in this chapter.

8.7 SUMMARY

Air Quality and Climate

The significance of the scheme for both the construction and operational phases of the proposed project are outlined in **Table 8.17**:

Environmental Impact	Phase	Classification of Significance
Air Quality	Construction	**Negligible**
	Operational	**Negligible**
Climate	Construction	**Negligible**
	Operational	**Slight Adverse**

Table 8.17 Classification of Significance of the Project

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Department of the Environment, Heritage and Local Government (DEHLG) (2003) Strategy to Reduce Emissions of Trans-boundary Pollution by 2010 to Comply with National Emission Ceilings - Discussion Document

Department of the Environment, Heritage and Local Government (DEHLG) (2000) National Climate Change Strategy

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USEPA (2004) User’s Guide to the AERMOD Meteorological Preprocessor (AERMET)

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9. NOISE AND VIBRATION

9.1 INTRODUCTION

Intel Ireland propose to undertake a conversion of FAB 24 at their existing Leixlip facility. This chapter has been prepared by AWN Consulting Limited and assesses the anticipated noise and vibration impact associated with the proposed development at nearby sensitive locations. The noise aspect of this chapter has been developed with due consideration to the fact that noise emissions associated with the site are regulated under the relevant sections of the Integrated Pollution Prevention & Control (IPPC) licence[1], as issued by the Environmental Protection Agency (EPA).

Typical noise sources associated with the planned development will be short-term construction noise and, once developed, process and building services and plant noise from the proposed manufacturing facility.

9.2 METHODOLOGY

The methodology adopted for this noise and vibration assessment is as follows:

- Characterisation of the receiving environment;
- Characterisation of the proposed development;
- Prediction of the noise and vibration impact associated with the proposed development, and;
- Evaluation of noise and vibration impacts.

9.3 FUNDAMENTALS OF ACOUSTICS

In order to provide a broader understanding of some of the technical discussion in this report, this section provides a brief overview of the fundamentals of acoustics and the basis for the preparation of this noise assessment.

A sound wave travelling through the air is a regular disturbance of the atmospheric pressure. These pressure fluctuations are detected by the human ear, producing the sensation of hearing. In order to take account of the vast range of pressure levels that can be detected by the ear, it is convenient to measure sound in terms of a logarithmic ratio of sound pressures. These values are expressed as Sound Pressure Levels (SPL) in decibels (dB).

The audible range of sounds expressed in terms of Sound Pressure Levels is 0dB (for the threshold of hearing) to 120dB (for the threshold of pain). In general, a subjective impression of doubling of loudness corresponds to a tenfold increase in sound energy which conveniently equates to a 10dB increase in SPL. It should be noted that a doubling in sound energy (such as may be caused by a doubling of traffic flows) increases the SPL by 3dB.

The frequency of sound is the rate at which a sound wave oscillates, and is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For example, hearing sensitivity decreases markedly as frequency falls below 250Hz. In order to rank the SPL of various noise sources, the measured level has to be adjusted to give comparatively more weight to the frequencies that are readily detected by the human ear. Several weighting mechanisms have been proposed but the 'A-weighting' system has been found to provide one of the best correlations with perceived loudness. SPLs measured using 'A-weighting' are expressed in terms of dB(A). An indication of the level of some common sounds on the dB(A) scale is presented in Figure 9.1.

The 'A' subscript denotes that the sound levels have been A-weighted. The established prediction and measurement techniques for this parameter are well developed and widely applied. For a more detailed

[1] Licence Register Number – No. 746.

introduction to the basic principles of acoustics, reference should be made to an appropriate standard text[2].

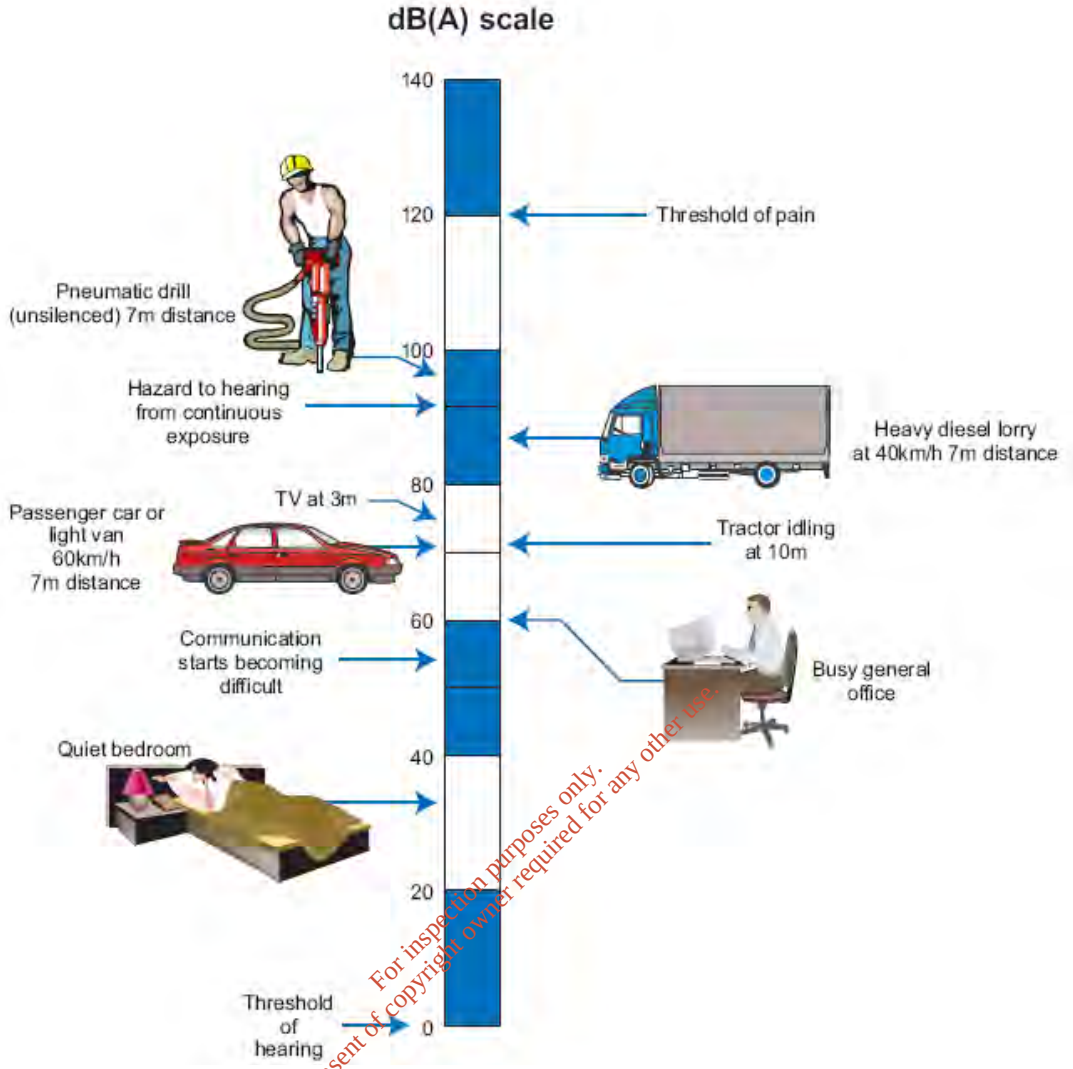


Figure 9.1 The Level of Typical Sounds on the dB(A) Scale[3]

9.4 RECEIVING ENVIRONMENT

9.4.1 ENVIRONMENTAL NOISE SURVEY

An environmental noise survey was conducted in order to quantify the existing noise environment. The survey was conducted in accordance with *ISO 1996: Acoustics – Description, measurement and assessment of environmental noise: 2007*. Specific details are set out below.

Choice of Noise Monitoring Locations

Noise measurements were conducted at seven positions on the site boundary and at noise-sensitive locations. These positions are the monitoring locations stipulated in the current IPPC Licence for the site. These locations are described below and shown on **Figure 9.2**.

NM01 Near the mechanical 'Middle Gate' on the western boundary of the site in line with the north façade of IR3.

NM02 On the Confey Road to the north of the site, at the entrance to the Intel soccer grounds.

NM03 At Riverview House. Please note that the noise monitoring position for the 2009, 2010 and 2011 surveys have changed slightly when compared to the location adopted for previous

[2] For example, Woods Practical Guide to Noise Control by Ian Sharland.
[3] NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004.

years. For the purposes of the annual IPPC assessment the attended noise monitoring position was moved away from the continuous noise monitor location (which is located in a field approximately 40 metres to the east of the house) and positioned adjacent to the façade of the Riverview property itself. This was done as it was noted by survey personnel that water flow noise from the river, as well as wind generated noise on nearby foliage and road traffic from the M4 motorway, were audible to a greater extent at the continuous monitor location than at the location of the house itself. The current monitoring location gives a more realistic indication as to Intel plant noise emissions at the façade of the house, as opposed to at the location of the continuous noise monitor.

NM04 On the Confey Road to the north of the site, adjacent to a nearby B&B.

NM05 At the north-eastern corner of the car-park to the east of FAB 24.

NM06 At the south-eastern corner of the car-park to the east of FAB 24.

NM07 At noise-sensitive locations beyond the southern boundary of the site.

Choice of Noise Monitoring Locations
Measurements were conducted over the course of the following survey periods:

- Daytime NM01 to NM04: 13:27 to 17:35hrs on 28 June 2011;
- Daytime NM05 to NM07: 13:26 to 17:23hrs on 2 August 2011;
- Night-time NM01 to NM04: 22:01 on 29 June to 01:47hrs 30 June 2011;
- Night-time NM05 to NM07: 23:13 on 3 August to 02:15hrs 3 August 2011.

During all of the survey periods noted above, it is understood that the facility was in normal operation. There are currently construction works on-going on the site. However it is considered that noise from construction activities did not contribute any significant degree to measured noise levels.

The weather during daytime survey periods was dry and calm, temperatures were in the range 15 to 19 degrees Celsius, wind speeds were in the range 1 to 2 m/s.

The weather during night-time survey periods was dry and calm, temperatures were in the range 8 to 11 degrees Celsius, average wind speeds were < 1 m/s.

As part of existing IPPC requirements Intel maintains a continuous noise monitor at Riverview House. A review of the data collated in relation to this station is presented in an Appendix to this Chapter of the EIS (see Appendix 9.1). The section also provides some general comment in terms of noise environment along the various boundaries of the Intel site.

Personnel and Instrumentation
James Mangan (AWN) conducted the noise level measurements during all survey periods. The measurements were performed using Brüel & Kjær Type 2250 and 2260 Modular Precision Sound Analysers. Before and after the survey the measurement apparatus was check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator.

Procedure
During each of the day-time and night-time periods, measurements were conducted on a cyclical basis. Sample periods were 15 minutes during both the daytime and night-time surveys. The results were saved to the instrument memory for later analysis where appropriate. Survey personnel noted all primary noise sources contributing to noise build-up.

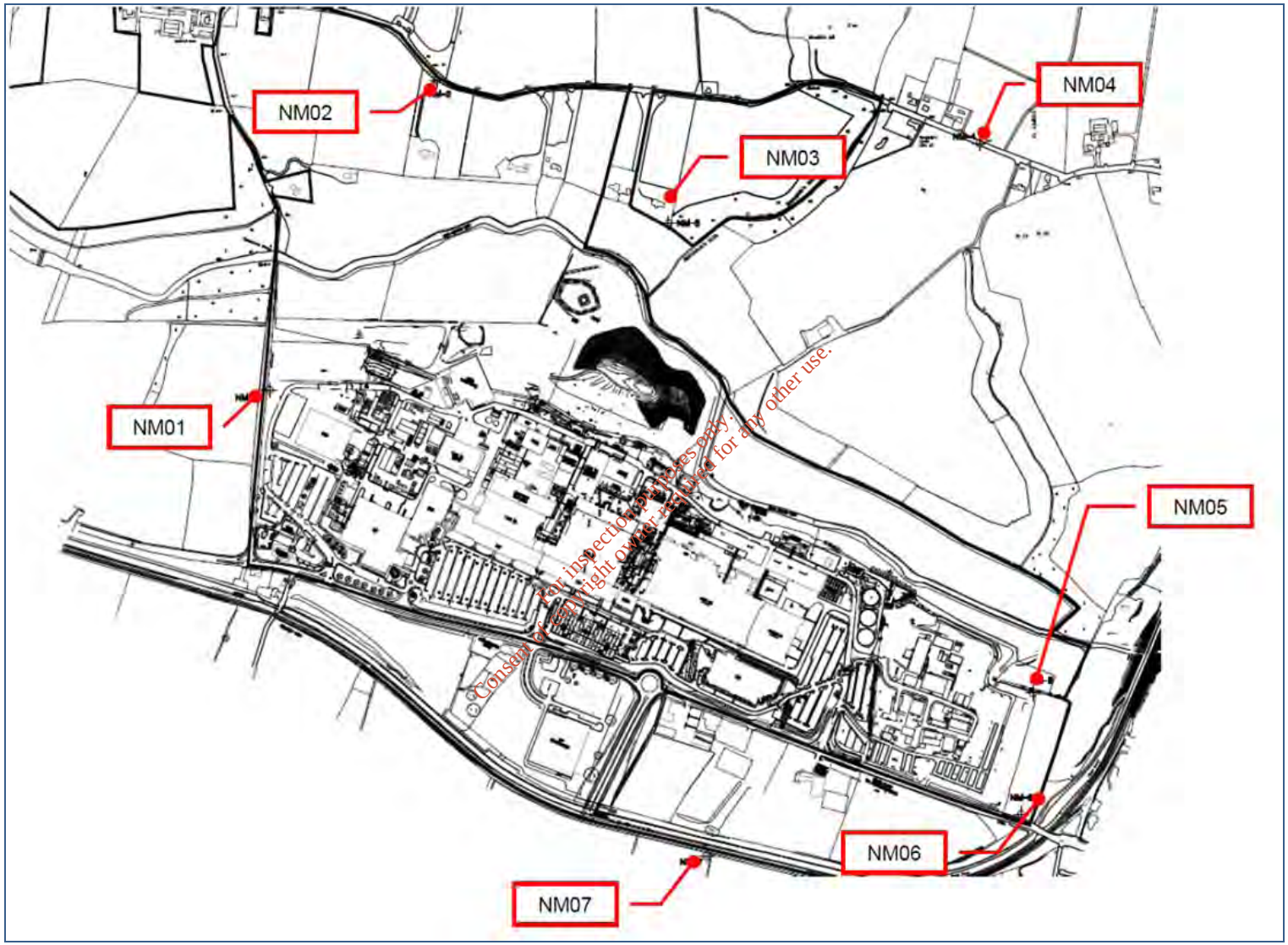


Figure 9.2 Noise Monitoring Locations

Measurement Parameters
The survey results are presented in terms of the following five parameters:

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

L_{Amax} is the instantaneous maximum sound level measured during the sample period.

L_{Amin} is the instantaneous minimum sound level measured during the sample period.

L_{A10} is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

Another parameter that will be commented upon in this report is the L_{ArT}.

$L_{Ar\,T}$ The L_{Aeq} during a specified time interval, plus specified adjustments for tonal character and impulsiveness of the sound.

It should be noted for this assessment it has been assumed that detailed design will be carried out in order that there will be not tonal or impulsive noise emissions for the development. Therefore, in this instance L_{Aeq} is equal to $L_{Ar\,T}$.

Monitoring Results
Location NM01

Period/Time		Measured Noise Levels, dB re $2x10^{-5}$ Pa				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	13:27-13:42	50	66	37	54	40
	14:47-15:02	48	62	40	51	42
	16:10-16:25	51	65	38	55	41
Night-time	22:01-22:16	45	64	34	48	38
	23:32-23:47	40	62	34	42	36
	00:51-01:06	44	65	30	45	32

Table 9.1 Noise Monitoring Results – Location NM01

During the daytime survey periods, distant road traffic movement on the R148 and Kellystown Lane along with occasional aircraft movements were noted as the primary contributors to the noise build-up. Occasional vehicle movements within the site were also audible as was distant plant noise from the Intel site and birdsong. Noise levels were in the range 48 to 51dB L_{Aeq} and 40 to 42dB L_{A90}.

During the night-time survey periods, audible noise sources included distant traffic on surrounding roads and, to a lesser extent, distant plant noise from the Intel site. Noise levels were in the range 40 to 45dB L_{Aeq} and 32 to 38dB L_{A90}.

During all measurement periods local road traffic movements along Kellystown Lane were paused out as far as possible in order to prevent this source from dominating the measured noise levels.

Location NM02

Period / Time		Measured Noise Levels, dB re $2x10^{-5}$ Pa				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	13:46-14:01	42	71	34	42	36
	15:49-16:04	46	63	37	48	39
	17:20-17:35	44	59	36	48	38
Night-time	22:20-22:35	41	64	34	41	36
	23:51-00:06	34	56	29	35	31
	01:13-01:28	37	55	32	38	33

Table 9.2 Noise Monitoring Results – Location NM02

During the daytime survey periods, distant road traffic movements were noted as the primary contributors to the noise build-up. Birdsong and a distant vehicle reversing alarm were also noted. Plant noise from the Intel site was inaudible during daytime periods at this location. Noise levels were in the range 42 to 46dB L_{Aeq} and 36 to 39dB L_{A90}.

During the night-time survey periods, audible noise sources included distant traffic on surrounding roads and very distant plant noise from the Intel site. Noise levels were in the range 34 to 41dB L_{Aeq} and 31 to 36dB L_{A90}.

During all measurements local road traffic movements were paused out as far as possible in order to prevent this source from dominating the measured noise levels.

Location NM03

Period / Time		Measured Noise Levels, dB re $2x10^{-5}$ Pa				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	14:05-14:20	46	65	39	48	40
	15:09-15:24	45	53	40	46	42
	16:33-16:48	48	62	40	50	43
Night-time	22:43-22:58	40	52	36	41	38
	00:11-00:26	36	55	33	38	34
	01:32-01:47	39	55	35	41	37

Table 9.3 Noise Monitoring Results – Location NM03

During daytime periods at this location, steady plant noise from the Intel site along with birdsong and distant traffic were the dominant noise sources. Distant construction noise was also audible. Noise levels were in the range 45 to 48dB L_{Aeq} and 40 to 43dB L_{A90}.

During night-time periods, steady plant noise was again the dominant source of noise. Occasional distant traffic movements were also audible. Noise levels were in the range 36 to 40dB L_{Aeq} and 34 to 38dB L_{A90}.

Location NM04

Period/Time		Measured Noise Levels, dB re $2x10^{-5}$ Pa				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	14:26-14:41	44	64	32	47	36
	15:29-15:44	45	64	32	49	37
	16:55-17:10	48	64	36	50	39
Night-time	23:14-23:29	36	54	31	36	33
	00:30-00:45	36	58	31	37	33
	01:52-02:08	35	55	31	37	33

Table 9.4 Noise Monitoring Results – Location NM04

During the daytime survey periods, distant road traffic movements were noted as the primary contributor to the noise build-up. Birdsong and occasional aircraft movements were also noted. Plant noise from the Intel site was not audible at this location. Noise levels were in the range 44 to 48dB L_{Aeq} and 36 to 39dB L_{A90}.

During night-time periods, occasional distant road traffic movements and distant plant noise from the Intel site were audible. Noise levels were in the range 35 to 36dB L_{Aeq} and of the order of 33dB L_{A90}.

During all measurements local road traffic movements were paused out as far as possible in order to prevent this source from dominating the measured noise levels.

Location NM05

Period/Time		Measured Noise Levels, dB re $2x10^{-5}$ Pa				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	14:02-14:17	48	69	35	48	38
	15:38-15:53	46	64	35	49	38
	16:45-17:00	48	65	33	50	38
Night-time	23:30-23:45	31	57	27	32	28
	00:39-00:54	43	52	36	46	38
	01:39-01:54	40	61	34	42	37

Table 9.5 Noise Monitoring Results – Location NM05

During the daytime survey periods, distant road traffic movements were noted as the primary contributor to the noise build-up. Plant noise from the Intel site was audible at low level as were construction vehicle movements. Birdsong, occasional distant train movements and aircraft movements were also noted. Noise levels were in the range 46 to 48dB L_{Aeq} and of the order of 38dB L_{A90}.

During the night-time survey periods, broadband plant noise was audible from the rear of the site. Other sources included occasional traffic on the R148 and distant traffic from the direction of the N4. An idling train was the dominant noise source during the second measurement period. Noise levels were in the range 31 to 43dB L_{Aeq} and 28 to 38dB L_{A90}.

Location NM06

Period/Time		Measured Noise Levels, dB re $2x10^{-5}$ Pa				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	13:26-13:41	49	65	41	51	45
	15:19-15:34	49	63	40	51	43
	16:25-16:40	50	60	42	53	45
Night-time	23:13-23:28	38	64	29	41	30
	00:22-00:37	36	50	29	38	31
	01:23-01:38	42	53	33	44	37

Table 9.6 Noise Monitoring Results – Location NM06

During the daytime survey periods, road traffic movements on the R148 were noted as the primary contributor to the noise build-up. Construction vehicle movements, birdsong, occasional train movements and distant aircraft movements were also noted. Plant noise from the Intel site was barely audible at this location. Noise levels were in the range 49 to 50dB L_{Aeq} and 43 to 45dB L_{A90}.

During the night-time survey periods, occasional road traffic movements on the R148 and broadband plant noise from the rear of the site were noted as being the primary contributors to the noise build-up. A site security vehicle was the dominant contributory noise source during the third night-time measurement period. Noise levels were in the range 36 to 42dB L_{Aeq} and 30 to 37dB L_{A90}.

Location NM07

Period/Time		Measured Noise Levels, dB re $2x10^{-5}$ Pa				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	14:26-14:41	52	70	40	57	43
	16:03-16:18	47	61	39	50	42
	17:08-17:23	48	71	40	50	43
Night-time	23:57-00:12	39	55	30	41	32
	01:01-01:16	44	60	34	48	39
	02:00-02:15	39	55	31	42	33

Table 9.7 Noise Monitoring Results – Location NM07

During the daytime survey periods, distant traffic on surrounding roads, occasional local traffic and train movements, children's voices and birdsong were noted to be contributory to the noise build-up. A distant lawnmower was noted during the first measurement period. Plant noise from the Intel site was not audible during the daytime measurement periods. Noise levels were in the range 47 to 52dB L_{Aeq} and 42 to 43dB L_{A90}.

Distant traffic movements were noted to be the dominant noise source during night-time periods. A local vehicle movement was noted during the second measurement period. Plant noise from the Intel site was not audible during the night-time measurement periods. Noise levels were in the range 39 to 44dB L_{Aeq} and 32 to 39dB L_{A90}.

General Comment on Noise Levels

The L_{Aeq} values are a type of average of the noise level during the measurement period. As it is a logarithmic average, it is especially sensitive to relatively loud noises of short duration. For example, a single passage of a vehicle can govern the L_{Aeq} value of a measurement over a period much longer than the time for which the vehicle was audible. Thus, where the noise emissions from the Intel site are steady, as plant items are in continuous operation, the L_{A90} value better reflects the magnitude of these emissions.

Discussion of Current Site Noise Emissions

The measured L_{Aeq} levels are within the daytime and night-time limit value laid out in the relevant IPPC licence applicable to the site at all locations. However in many instances the $L_{Aeq,15min}$ values are governed by sources not related to the site such as traffic on public roads, aircraft movements, train movements and birdsong. During the survey detailed in previous sections the measurements were paused as much as possible during local traffic movements and other individual events not associated with the Intel site. This explains the decrease in the reported levels at some locations when compared to surveys conducted in previous years for both planning and IPPC requirements.

9.5 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development comprises the reconfiguration of the existing FAB 24 on site and associated infrastructure. A number of extensions to the building structure are required in order to facilitate this reconfiguration.

The potential noise-related elements of the facility are process machinery and mechanical services plant. The various operations associated with the overall proposed facility contain boilers, air compressors, chillers, cooling towers, exhaust stacks and pumps etc.

When considering a development of this nature, the potential noise and vibration impact on the surroundings must be considered for each of two distinct stages: the short term impact of the construction phase and the longer term impact of the operational phase.

The primary sources of noise during the construction phase will be temporary and include:

- Ground preparation phase - excavators, dump trucks and dozers for ground excavation, spreading fill and levelling;
- Structural phase – installation of foundations and erection of building extensions involving the use of equipment such as compressors, generators, pneumatic tools, hand-held power tools and mobile/fixed cranes.

The primary sources of noise during the operational phase of the proposed development will be long-term and are discussed below:

- Additional manufacturing and Building Services plant, and;
- Additional Vehicular Traffic on Existing Public Roads.

The primary sources of vibration during the construction phase of the proposed development will be short-term. Existing operations and processes on site have low tolerances to vibration and therefore construction methodologies and procedures will be adopted on the site with this consideration in mind. There are therefore no predicted vibration impacts at neighbouring dwellings, during the construction phase.

No significant sources of vibration will be present during the operational phase. There are therefore no predicted vibration impacts at neighbouring dwellings during the operational phase.

9.6 REVIEW OF RELEVANT GUIDANCE

9.6.1 NOISE CRITERIA

Construction Phase

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

In the absence of specific noise limits, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the British Standard *BS 5228 – 1: 2009: Code of practice for noise and vibration control on construction and open sites – Noise*.

The approach adopted here calls for the designation of a noise sensitive location into a specific category (A, B or C) based on exiting ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a significant noise impact is associated with the construction activities.

This document sets out guidance on permissible noise levels relative to the existing noise environment. Table 9.8 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors as recommended by BS 5228 – 1. These are cumulative levels, i.e. the sum of both ambient and construction noise levels.

Assessment Category and Threshold Value Period (L_{Aeq})	Threshold Value (dB)		
	Category A [A]	Category B [B]	Category C [C]
Night-time (23:00 to 07:00hrs)	45	50	55
Evenings & Weekends [D]	55	60	65
Daytime (07:00 – 19:00hrs) and Saturdays (07:00 – 13:00hrs)	65	70	75

Table 9.8 Example Threshold of Significant Effect at Dwellings

Note A: Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
Note B: Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
Note C: Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.
Note D: 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

It should be noted that this assessment method is only valid for residential properties. The following method should be followed. For the appropriate periods the ambient noise level is determined and rounded to the nearest 5dB. Baseline monitoring carried out as in relation to the site4 would indicate that the categories detailed in Table 9.9 are appropriate in terms of the nearest noise sensitive locations being considered in this instance.

Period	Location	Measured Baseline Noise Level L_{Aeq} (dB)	Rounded Baseline Noise Level L_{Aeq} (dB)	Category	Threshold value, in decibels (dB)
Daytime (07:00 – 19:00hrs) and Saturdays (07:00 – 13:00hrs)	NM01	62	60	A	65
	NM03	54	55	A	65
	NM04	69	70	C	75
	NM05	51	50	A	65
	NM07	56	55	A	65

Table 9.9 Rounded Baseline Noise Levels and Associated Categories

Therefore in instances, when construction noise along with baseline noise levels (i.e. cumulative levels) are considered exceed 65dB $L_{Aeq(1hr)}$ at locations NM01, NM03, NM05 and NM07 a significant constriction noise impact is deemed to have occurred. In relation to location NM04 the relevant threshold value for the identification of a significant construction noise impact is 75dB $L_{Aeq(1hr)}$.

[4] Baseline construction noise monitoring report is presented in and Appendix too this Chapter of the EIS (see Appendix 9.3).

Operational Phase

It is a requirement of the IPPC Licence, issued by the EPA and held by Intel Ireland that environmental noise levels in the vicinity of the site are monitored on an annual basis. Condition 5 of the Licence sets out the following requirements in relation to noise:

Condition 5:

5.1 No specified emission from the installation shall exceed the emission limit values set out in Schedule B: Emission Limits of this licence. There shall be no other emissions of environmental significance.

Schedule B4 pertains to noise and specifies the following limits:

B.4. Noise Emissions

Daytime dB(A) $L_{Aeq\ (15\ minutes)}$	Night-time dB(A) $L_{Aeq\ (15\ minutes)}$
55[Note 1]	45[Note 1]

Note 1: There shall be no clearly audible tonal or impulsive component in the noise emission from the site at any noise sensitive location

Paragraph 4.5 of the Interpretation section of the licence also applies to noise:

4.5 Noise from the installation shall not give rise to sound pressure levels (Leq,T) measured at any noise-sensitive location that exceed the specified limit values by more than 2dB(A).

Daytime is taken as 08:00 to 22:00hrs and night-time 22:00 to 08:00hrs as stated in the EPA publication *Guidance Note For Noise In Relation To Scheduled Activities, Second Edition (2006)*.

The issue of significance of impact involves the assessment of the change in noise level between a baseline scenario and any future situation (i.e. reconfiguration of FAB 24). The relationship between the magnitude of increase in noise level and typical perceived impact is shown in Table 9.10. It shows that small changes in noise levels are not normally noticeable, whereas an increase of 10dB would be described as a doubling of loudness.

Change in Sound Level (dB)	Subjective Reaction	Magnitude of Impact	EPA Glossary of Impacts[5]
0	None	No Change	No Change
0.1 – 2.9	Imperceptible	Negligible	Imperceptible Impact
3 – 4.9	Perceptible	Minor	Slight Impact
5 – 9.9	Up to a doubling of loudness	Moderate	Moderate Impact
10 – 14.9	Over a doubling of loudness	Major	Significant Impact
>15	Over a doubling of loudness	Profound	Profound Impact

Table 9.10 Significance of Change in Noise Levels

9.6.2 VIBRATION CRITERIA

Construction Phase

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

[5] Environmental Protection Agency – Guidelines on the information to be contained in Environmental Impact Statements (Section 5), 2002.

It is acknowledged that humans are particularly sensitive to vibration stimuli and that any perception of vibration may lead to concern. In the case of road traffic, vibration is perceptible at around 0.5mm/s and may become disturbing or annoying at higher magnitudes. However, higher levels of vibration are typically tolerated for single events or events of short duration. For example, rock breaking and piling, two of the primary sources of vibration during construction, are typically tolerated at vibration levels up to 12mm/s and 5mm/s respectively. This guidance is applicable to the daytime only; it is unreasonable to expect people to be tolerant of such activities during the night.

Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- British Standard *BS 7385: 1993: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration*, and;
- British Standard *BS 5228-2: 2009: Code of practice for noise and vibration control on construction and open sites – Vibration*.

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.

BS 5228 recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above. Below these values minor damage is unlikely. Where continuous vibration is such as to give rise to dynamic magnification due to resonance, the guide values may need to be reduced by up to 50%. BS 5228-2 also comments that important buildings which are difficult to repair might require special consideration on a case by case basis.

The NRA document Guidelines for the Treatment of Noise and Vibration in National Road Schemes also contains information on the permissible construction vibration levels as follows:

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	**10 to 50Hz**	**50 to 100Hz (and above)**
8 mm/s	12.5 mm/s	20 mm/s

Table 9.11 Allowable Vibration During Construction Phase

As stated previously existing operations and processes on site have low tolerances to vibration and therefore construction methodologies and procedures will be adopted on the site with this consideration in mind.

Operational Phase

No significant sources of vibration are associated with the operational phase of the FAB 24 reconfiguration project.

Forecasting Methods

Construction noise calculations have been conducted generally in accordance with *BS 5228: 2009: Code of practice for noise control on construction and open sites – Noise*.

Prediction calculations for building services and mechanical plant noise have been conducted generally in accordance with *ISO 9613 (1996): Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation.*

Traffic noise levels are predicted in accordance with guidance set out in *Calculation of Road Traffic Noise* (CRTN).

9.7 POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT

9.7.1 CONSTRUCTION PHASE

It is predicted that the construction programme will create typical construction activity related noise on site. During the construction phase of the proposed development, a variety of items of plant will be in use, such as excavators, lifting equipment, dumper trucks, compressors and generators.

Due to the nature of the activities undertaken on a construction site of this nature, there is potential for generation of significant levels of noise. The flow of vehicular traffic to and from a construction site is also a potential source of relatively high noise levels. The potential for vibration at neighbouring sensitive locations during construction is typically limited to excavation works and lorry movements on uneven road surfaces. Due to the proximity of sensitive locations to potential site access points, the more significant of these is likely to be uneven road surfaces. However, there is little likelihood of structural or even cosmetic damage to existing neighbouring dwellings.

Due to the fact that the construction programme has been established in outline form only, it is difficult to calculate the actual magnitude of noise emissions to the local environment. However, Table 6 indicates typical noise levels that would be expected from the proposed construction site during the various phases of the construction project.

For the purposes of the assessment we have assumed that standard good practice measures for the control of noise from construction sites will be implemented. These issues are commented upon in further detail in the mitigation section of this report.

Description	A-weighted Sound Power Level re 10^{-12} W at Octave Band Centre Frequency (Hz)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Dump Truck	70	81	82	92	99	107	92	76	108
Excavator	72	87	93	101	104	101	98	92	108
Front End Loader	83	97	98	104	105	104	97	86	110
Generator	63	70	82	81	83	80	71	60	94

Table 9.12 Typical Noise Levels Associated with Construction Plant Items

Table 9.13 presents the predicted noise levels from an indicative construction period on site. Note construction noise sources are assumed to be running 66% of the time. There are no items of plant that would be expected to give rise to noise levels that would be considered out of the ordinary or in exceedance of the levels outlined in Table 9.9.

Location	Measured Baseline Noise Level L_{Aeq} (dB)	Predicted Construction Noise Level L_{Aeq} (dB)	Cumulative Noise Level L_{Aeq} (dB)	Threshold value, in decibels (dB)	Complies?
NM01	62	18.5	62	65	✓
NM03	54	36.5	54	65	✓
NM04	69	31.4	69	75	✓
NM05	51	51.2	54	65	✓
NM07	56	26.9	56	65	✓

Table 9.13 Review of Potential Construction Noise Impact

Figure 9.3 presents a construction noise contour map for the indicative construction scenario outlined previously.

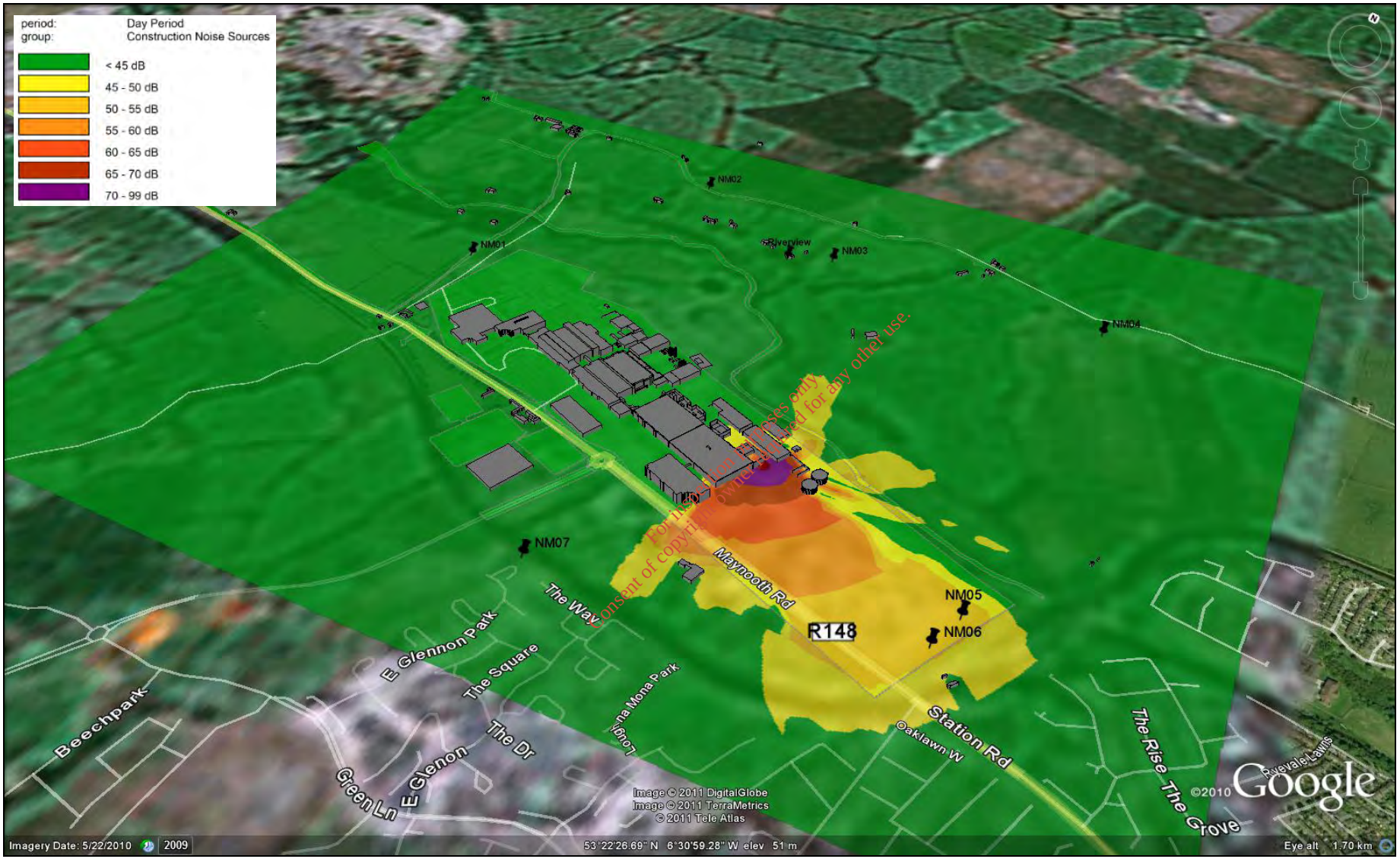


Figure 9.3 Construction Noise Contour

The impact on the noise environment due to construction activities will be transient in nature and mitigation measures will be implemented to minimise the impact of construction activities on the noise environment.

9.7.2 OPERATIONAL PHASE

The primary sources of noise during the operational phase of the proposed development will be long-term and are discussed below:

- Additional Manufacturing and Building Services plant, and;
- Additional Vehicular Traffic on Existing Public Roads.

Additional Manufacturing & Building Services Plant

Noise Propagation Calculation

Brüel & Kjær Predictor Type 7810 is a proprietary noise calculation package for computing noise levels in the vicinity of industrial sites. Calculations are based on *ISO9613-2:1996 Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation.* This method has the scope to take into account a range of factors affecting the sound propagation, including:

- the magnitude of the noise source in terms of sound power;
- the distance between the source and receiver;
- the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces;
- the hardness of the ground between the source and receiver;
- attenuation due to atmospheric absorption;
- meteorological effects such as wind gradient, temperature gradient, humidity (these have significant impact at distances greater than approximately 400m).

Calculations have been performed in octave bands from 63Hz to 8kHz as well as in overall dB(A) terms.

Brief Description of ISO9613-2: 1996

ISO9613-2:1996 calculates the noise level based on each of the factors discussed previously. However, the effect of meteorological conditions is significantly simplified by calculating the average downwind sound pressure level, $L_{AT}(DW)$, for the following conditions:

- wind direction at an angle of ±45° to the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and;
- wind speed between approximately 1ms-1 and 5ms-1, measured at a height of 3m to 11m above the ground.

The equations and calculations also hold for average propagation under a well developed moderate ground based temperature inversion, such as commonly occurs on clear calm nights.

The basic formula for calculating $L_{AT}(DW)$ from any point source at any receiver location is given by:

$$L_{fT}(DW) = LW + Dc - A \qquad \textbf{Eqn. A}$$

Where:

$L_{fT}(DW)$ is an octave band centre frequency component of $L_{AT}(DW)$ in dB relative to $2x10^{-5}$Pa;
L_W is the octave band sound power of the point source;
D_c is the directivity correction for the point source;
A is the octave band attenuation that occurs during propagation, namely attenuation due to geometric divergence, atmospheric absorption, ground effect, barriers and miscellaneous other effects.

The estimated accuracy associated with this methodology is shown in Table 9.14 below:

Height,h*	Distance, d†	
	0 < d < 100m	100m < d < 1,000m
0<h<5m	±3dB	±3dB
5m<h<30m	±1dB	±3dB

Table 9.14 Estimated Accuracy for Broadband Noise of L_{AT}(DW)

* h is the mean height of the source and receiver.
† d is the mean distance between the source and receiver.
N.B. These estimates have been made from situations where there are no effects due to reflections or attenuation due to screening.

Initial Configuration of the Noise Model
The input to the noise model was an overall site plan, a set of buildings and noise sources.

The buildings in the model were restricted to those on the Intel Ireland site. These were input to the model using a previous iteration of the noise model that has been developed. The location and height of the buildings have been amended to reflect the Irish Ordnance Survey Grid. Furthermore, the ground model utilised in the updated version of the noise model was generated using a detailed digital terrain map (DTM) of the area.

Each noise source was input as sound power in octave bands. The sound power of each source was measured in accordance with BS4196:1991: *Determination of sound power levels using sound pressure*. This standard involves the measurement of sound pressure at a set of points on an enveloping surface around the source, and applying a correction to the measured level to obtain the sound power of the source. Where direct noise measurement were not possible, noise data has been input into the model based on plant manufacturers technical data and/or empirical formulae. Predictor accepts sound power levels in octave bands from 63Hz to 8kHz.

Each source also has its own position, height and directivity. All assessed noise sources and their sound power levels are listed in an appendix to this Chapter of the EIS (see Appendix 9.2).

In terms of the calculation, a ground attenuation factor (general method) of 1.0 and no metrological correction were assumed for all calculations. The following atmospheric attenuation was assumed for all calculations.

Temp (°C)	% Humidity	Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
10	80	0.11	0.37	1.02	1.96	3.57	8.79	28.97	104.57

Table 9.15 Atmospheric Attenuation Assumed for Noise Calculations (dB per km)

Output of the Noise Model
Predicted noise levels are calculated for a set of receiver points, which can be chosen by the user. The results include an overall level in dB(A) and an A weighted spectrum for each item in a list of the contributing sources. The items in the list can be ranked in order of their contribution, and thus the noisiest items can be identified.

Predictions are also made for a grid of receiver points, and coloured iso contours of the noise levels are be displayed, to give an overall picture of the spatial distribution of noise levels within the grid.

Calibration of the Noise Model
In order to check the accuracy of the noise model, it was configured to predict site noise level emissions at the location the seven noise monitoring locations detailed in the IPPC licence. This situation nominally corresponds to that prevailing throughout the period of operation of the continuous noise monitor.

The predicted plant noise emissions for current operations are compared to the 2011 measured IPPC licence noise levels in Table 9.16 below.

The 2011 measured IPPC noise levels are presented using the L_{A90} parameter which is the sound level that is exceeded for 90% of the sample period. This parameter is considered representative of the specific noise from plant when there is extraneous noise from intermittent noise sources such as traffic.

Location	Measurement Period	2011 IPPC Measured Noise Levels dB $L_{A90, 15mins}$	2011 Predicted Plant Noise Levels, dB $L_{Aeq,T}$
NM01	Daytime	40 - 42	41.2
	Night-time	32 – 38	
NM02	Daytime	36 - 39	37.9
	Night-time	31 - 36	
NM03	Daytime	40 - 43	39.3
	Night-time	34 - 38	
NM04	Daytime	36 - 39	34.9
	Night-time	33	
NM05	Daytime	38	39.3
	Night-time	28 - 38	
NM06	Daytime	43 - 45	39.6
	Night-time	30 – 37	
NM07	Daytime	42 - 43	38.8
	Night-time	32 - 39	

Table 9.16 Assessment of Predicted Plant Noise Levels vs. 2011 IPPC Noise Levels

It is considered that the predicted noise emissions provide an accurate representation of noise emissions from the site. There are some minor discrepancies in predicted vs. measured noise levels which may be attributed to the following constraint.

The 2011 IPPC noise survey was conducted in extremely calm conditions, the Brüel & Kjaer Predictor software appears to be calculating slightly higher than the measured 2011 IPPC values; a portion of this is attributable to the software package and prediction standard which calculates all receivers as if down-wind as this represents 'worst case' conditions.

It is concluded that the predicted levels are generally consistent with the measured values, thus verifying the accuracy of the noise model.

Results of the Noise Model

Noise levels have been predicted at a total of 7 locations as summarised in the Table 9.17, representing the noise monitoring locations associated with the current IPPC Licence. The change of location at the continuous noise monitor at Riverview House has also been included. These values include contributions from all buildings on site and consider the planned developments and retro fitting projects associated with FAB 10, 14 and 24.

Reference	Predicted Noise Levels, dB $L_{Aeq,T}$
NM01	41.8
NM02	39.7
NM03	42.2
NM04	37.6
NM05	43.5
NM06	43.3
NM07	41.7

Table 9.17 2011 Planning Scenario Predicted Noise Levels

Examination of this octave band data confirms that the predicted noise levels at the receiver locations do not exhibit any audible tonal component.

Discussion of Noise Impact

The results of the prediction model are compared to the IPPC licence noise limits in Table 9.18.

Reference	Predicted Noise Levels, dB $L_{Aeq,T}$	IPPC Limit Values dB L_{Aeq},T	Satisfies?
NM01	41.8	55 Daytime/ 45 Night-time	✓
NM02	39.7		✓
NM03	42.2		✓
NM04	37.6		✓
NM05	43.5		✓
NM06	43.3		✓
NM07	41.7		✓

Table 9.18 Assessment of Predicted Plant Noise Levels vs. EPA Noise Criteria

Predicted plant noise emissions are therefore within the daytime and night-time limit values at all locations. The relevant noise contour map for this scenario is presented in Figure 9.4.

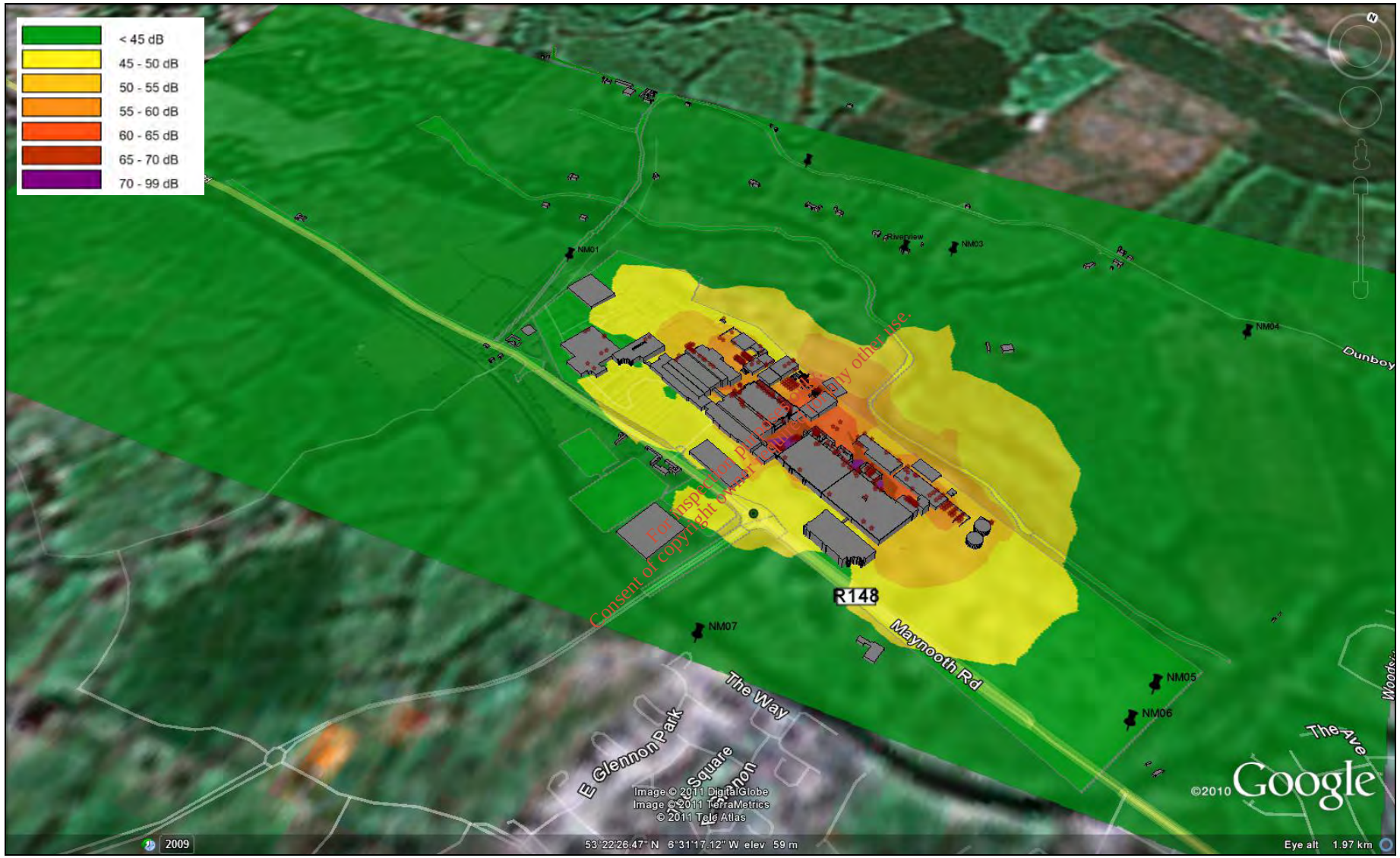


Figure 9.4 Operational Noise Contour

The issue of significance of impact involves the assessment of the change in noise level between a baseline scenario and any future situation. The relationship between the magnitude of increase in noise level and typical perceived impact is shown in Table 9.10. It shows that small changes in noise levels are not normally noticeable, whereas an increase of 10dB would be described as a doubling of loudness.

Table 9.19 presents the predicted noise levels at the monitoring locations during site operations for the baseline situation (i.e. current site) and the proposed situation (i.e. 2011 FAB 24 conversion model) and states the expected associated noise impacts.

Reference	Baseline Noise Model Predicted Plant Noise Level, dB $L_{Aeq,T}$	Current Application Predicted Noise Levels, dB $L_{Aeq,T}$	Predicted Change in Site Noise Emissions dB $L_{Aeq,T}$	EPA Glossary of Impacts
NM01	41.2	41.8	+0.6	Imperceptible
NM02	37.9	39.7	+1.7	Imperceptible
NM03	39.3	42.2	+2.8	Imperceptible
NM04	34.9	37.6	+2.6	Imperceptible
NM05	39.3	43.5	+3.4	Slight
NM06	39.6	43.3	+3.0	Slight
NM07	38.8	41.7	+2.7	Imperceptible

Table 9.19 Predicted Change in Plant Noise Levels due to Current Proposals

The predicted plant noise levels at the nearest noise sensitive locations considering current site operations are in the range 34.9 to 41.2dB L_{Aeq}.

Various items of plant are associated with the current application and the noise model has been updated to reflect the impact of these plant items on site conditions. The predicted plant noise levels at the nearest noise sensitive locations, following the plant reconfiguration etc., are in the range 37.6 to 43.5dB L_{Aeq}.

As can be seen, changes in noise level range from 0.6 to 3.4dB at the various locations assessed. Reference to Table 9.10 confirms that increase the impact of an in noise of this order of magnitude is imperceptible with the exception locations of NM05 and NM06 where the predicted impact associated with the change in noise level is 'slight'. Note that in all instances the predicted calculations are worst case using the assumption that receivers are downwind of all sources on site at any one time. In reality this typically will not be the case. Also it should be noted that conservative assumptions have been made in relation to source noise levels related to plant items associated with the FAB 24 conversion aspect of the site noise model.

Additional Vehicular Traffic on Existing Public Roads
In order for a perceptible increase in traffic noise to occur traffic volumes have to double in number. It is understood that traffic volumes along the R148 will not change by this order of magnitude as a result of the proposed development. Therefore no perceptible change in noise due to traffic on the local road network is expected as a result of the proposal assessed in this document.

9.8 MITIGATION MEASURES

In order to sufficiently ameliorate the likely noise impact, a schedule of noise control measures has been formulated for both construction and operational phases associated with the proposed development.

9.8.1 CONSTRUCTION PHASE

With regard to construction activities, reference will be made to BS5228: *Noise control on construction and open sites*, which offers detailed guidance on the control of noise and vibration from demolition and construction activities. Various mitigation measures can be considered and applied during the construction of the proposed development, such as:

- Limiting the hours during which site activities likely to create high levels of noise or vibration are permitted;
- Establishing channels of communication between the contractor/developer, Local Authority and residents;
- Appointing a site representative responsible for matters relating to noise and vibration;
- Monitoring levels of noise during critical periods and at sensitive locations;
- All site access roads will be kept even so as to mitigate the potential for vibration from lorries.

Furthermore, it is envisaged that a variety of practicable noise control measures will be employed. These may include:

- Selection of plant with low inherent potential for generation of noise and/ or vibration;
- Erection of barriers as necessary around items such as generators or high duty compressors;
- Situate any noisy plant as far away from sensitive properties as permitted by site constraints and the use of vibration isolated support structures where necessary.

We would recommend that vibration from construction activities to off-site residences be limited to the values set out in Table 9.11. It should be noted that these limits are not absolute, but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage these limits may need to be reduced by up to 50%.

9.8.2 OPERATIONAL PHASE

Historically, on the Intel site, noise from external plant has been minimised by purchasing low noise generating equipment and including noise barriers, enclosures and incorporating appropriately specified in line attenuators for stacks and exhausts where necessary. This approach has resulted in Intel operating well within the constraints of the IPPC noise limits that apply to the site as demonstrated in the IPPC noise monitoring that has been commented upon in earlier sections of this document.

The continuation of this attenuation ethos and programme will maintain the level of noise emissions from the Intel site in line with the relevant IPPC day and night criteria.

Additional noise attenuation has been retrofitted to the existing site as part of an on-going noise management programme and will continue to be installed to attain noise levels that are within the current IPPC licence limits.

9.9 SUMMARY OF IMPACTS

This section summarises the likely noise and vibration impact associated with the proposed development, taking into account the mitigation measures.

9.9.1 CONSTRUCTION PHASE

During the construction phase of the project there will be some impact on nearby noise sensitive properties due to noise emissions from site traffic and other activities. The application of binding noise limits and hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration impact is kept to a minimum.

9.9.2 OPERATIONAL PHASE

Proprietary noise and vibration control measures will be employed in order to ensure that noise emissions from building services plant do not exceed the adopted criterion at the façade of any nearby noise sensitive locations. In addition, noise emissions should be broadband in nature and should not contain any tonal or impulsive elements. The resultant noise impact is not significant.

Additional Vehicular Traffic on Existing Public Roads
Any change in noise levels associated with vehicles at road junctions in the vicinity of the proposed development is expected to be imperceptible. The resultant noise impact is not significant.

10. LANDSCAPE AND VISUAL IMPACT

10.1 INTRODUCTION

This section describes how the proposed development will affect the appearance and character of the area. The assessment is supported by a series of images that illustrate how the project will appear 'before' and 'after' from a number of locations. Where adverse effects (if any) on the landscape are anticipated then measures to avoid, reduce or remedy such effects are described. This section has been prepared on the basis of visits to the site and its context, examination of relevant documentation such as the Development Plan of the County as well as Ordnance Survey Plans and maps at various scales. The report also draws on experience of evaluating the impacts of other large-scale industrial projects elsewhere in Ireland.

10.2 METHODOLOGY

The assessment has been carried out by a chartered Landscape Architect[1] using standardized assessment techniques[2] . The assessment is based on a field examination of the site and its wider environs in context of the relevant regulatory documentation. Photography was carried out using a 35mm format SLR camera fitted with a 'standard lens' [55mm]. Locations, distances and orientations were referenced from the 1:50,000 Ordnance Survey of Ireland Discovery Series, The Methodology for the photography and the preparation of the photomontages in contained in Appendix 10.

The assessment follows the layout and content suggested by the EPA Guidelines on Information to be Contained in EISs and also has regard to the IEMA/LI Guidelines on Landscape and Visual Impact Assessment [see below].

Description of the receiving environment [environs and site] having regard to:

- Context
- Character
- Significance [including designations]
- Sensitivity

Description of the proposed development including:

- Siting
- Design
- Site Works

Description of the likely significant impact including:

- Potential Impacts
- Residual Impacts

Description of Mitigation Measures including:

- Avoidance

[1] D. Conor Skehan MILI, MRIAI, MLA, B.Arch (Sc). Dipl. Arch. is a co-founder and past president of the Irish Landscape Institute and a registered Impact Assessor with the Institute of Environmental Assessment and Management as well as the International Association of Impact Assessment. He is the author of the EPA's statutory Guidelines on the Information to be contained in Environmental Impact Statements and the accompanying Advice notes. He is also a co-author of both editions of the standard text Guidelines on Landscape and Visual Impact Assessment (Spons, London, 1995, 2002).

[2] Guidelines on the Information to be contained in Environmental Impact Statements (EPA, Ireland, 2002) Guidelines on Landscape and Visual Impact Assessment (Spons, London, 1995, 2002).

10.3 THE EXISTING LANDSCAPE

This section provides a description of the existing appearance and character of the area which establishes a reference - or 'baseline' against which to assess the likely effects of the project.

10.3.1 CONTEXT

The site lies in the Rye water Valley within the Plain of Kildare on the western outskirts of the ancient settlement of Leixlip.

10.3.2 CHARACTER

The Kildare County Development plan classifies this as part of the 'Northern Lowlands' of the County which is described comprising predominately fertile lands with high levels of population and intensive land management (agriculture). The slope and topography in the area occurs in a shallow/gradual transition. Agricultural lands tend to be characterised by extensive views across large fields as a result of the generally low well-trimmed hedges.

Technically the site is also part of a river corridor [the Rye Water] as well as part of a Canal Corridor [the Royal canal] which is recognised by the development plan as a 'landscape within a landscape'. River corridors are described as representing particularly important Character Areas for an inland county such Kildare. A number of canals and rivers meander through the County and define the landscape around them.

Canal corridors are characterised by generally open views to surrounding pasture and agricultural lands. The canal banks are generally wooded (e.g. reed and natural vegetation), although large sections move directly into open pasturelands. Canal corridors and banks can generally be classified vulnerable to sensitive.

10.3.3 SENSITIVITY

General Sensitivities

Within the Kildare County development plan Northern Lowland landscapes are generally classified as robust to normal, however sensitive areas or landscape factors can be found at specific locations. River and canal corridors and banks are generally classified vulnerable to sensitive.

Local Sensitivities

The R 148 the former Dublin to Galway road is a busy road where any adverse effects might be expected to affect a significant number of viewers.

The elevated route of the canal and railway, west of Leixlip, is frequented by many people, either as walkers or as train passengers. The link from the M4 affords elevated views toward the site from places where it is raised as it crosses the canal and railway.

The Rye Water Valley as viewed from its eastern and western ends (the viaduct and Sandford's Bridge respectively), are local amenities. The eastern and western ends of the valley are designated as "Amenity /Open Space" areas in the Development Plan.

Residences located behind the break of slope on the ridge to the north east of the Rye Water Valley have expressed concerns about the potential visual impact upon their residences

10.3.4 SIGNIFICANCE

Views [of the Royal Canal] from Louisa Bridge and from Sandford's Bridge [of the Rye water] are included in the schedule of Views and Vistas of the Development Plan.

10.4 DESCRIPTION OF THE PROPOSED DEVELOPMENT

There are descriptions of the proposed building development contained in section 2 of this EIS as well as more detailed descriptions of the Planning Application Report that accompanies this application. The critical elements with a capacity to affect the appearance and character of the landscape are:

- The changes to the production facility – on account of its height and character
- The changes to the utility structures –on account of their extent and character
- The new water tanks near the eastern boundary berm

10.5 DESCRIPTION OF VISUAL IMPACTS

There is no single definitive visual impact of a project. Instead there are a series of effects - each different in appearance and degree - that occur throughout the area from which the project is visible. This section describes the visual impact from a number of locations some of which are immediately adjacent [View 1] and one which is at greater distances distance.

This section provides a commentary to accompany the 'before and after' photographic images. In each instance the 'Existing, photograph is described and assessed - before providing a commentary on how the 'Proposed' image illustrates the visual impact of the proposed development from the selected location. Each section concludes with a description of the visual impact from that location. [Note that larger versions of each photographic image are contained in the EIS at Appendix 10 – these views also contain 'redline' versions of the photomontages to make it easier to discern new works from old]

10.5.1 SIGNIFICANCE

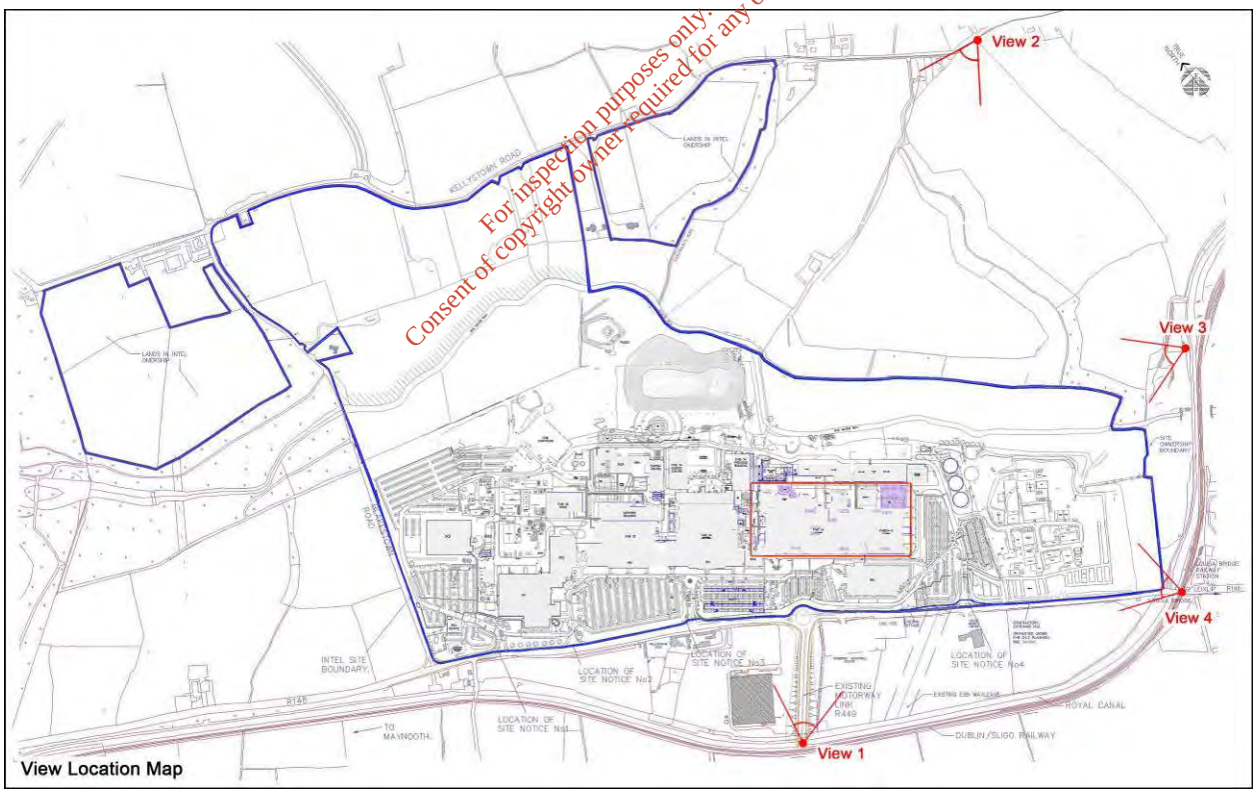


Figure 10.1 View Location Map

These view locations have been selected in attempt to satisfy the following criteria:

- To provide continuity with the relevant Viewing Points used in previous EISs [FAB 14, FAB 24]
- To obtain views from locations where the development would be visible from the public realm
- To illustrate 'worst case' views
- Concentrations of potential viewers
- Locations of amenity significance

A number of viewing locations were initially considered which included;-

- The R148 west of Intel
- The junction of Blakestown Rd and the R148
- The junction of Blakestown Rd and Kellystown Rd

Field work established that there is no potential visibility from these locations so no further evaluation occurred.

The view from elevated portions of the R449 in the vicinity of the junction with the M4 was also examined. These were deemed to be at too great a distance for the effective application of photomontage techniques – so a narrative description is included in section 10.1.5.

Four Views were identified that satisfied the criteria outlined above;-

- View 1 On the Motorway Link R449
- View 2 On Kellystown Rd
- View 3 on the western embankment of the Royal Canal
- View 4 at Louisa Bridge

These views are described and examined in the following sections.

View 1 On the Motorway Link R449

Figure 10.2 View 1 (On the Motorway Link) – Existing

This is the closest view from a public road that has the potential to have views towards the new development. The location of this view has been selected because of the more expansive views afforded by the elevation at this point on the Motorway Link Road R449, as it crosses the canal and railway line. This view illustrates the established character that arises from the combination of the industrial development and large-scale infrastructure that are concentrated in this area. The view also illustrates how the site design strategy reduces the visual effects that are seen from the closest public roads - because site planting and the site office accommodation screen views of these less orderly process, utility and delivery areas of the development.

View 1 On the Motorway Link R449

Figure 10.3 View 1 (On the Motorway Link) – Proposed

This view shows that the appearance and character of this view are largely unchanged. New development is almost completely screened from view by intervening existing buildings. A very small enlargement of a brown rooftop enclosure is discernable to the left of the centre of the image [directly above the left hand side of the black car in the foreground] and one additional flue is visible in the centre of the image. This is confirmed by the 'redline' image below which confirms the location of features that are screened by existing buildings. (See the Appendix to this Chapter for full page reproductions of these images.)

View 2 On Kellystown Road

Figure 10.4 View 2 (On Kellystown Road) – Existing

There are relatively few views from Kellystown Road towards the site on account of tall roadside vegetation. Those that can be found, such as this, are available only through open gates. In such views the buildings are distantly visible [over 1 km distant]. The development site is seen in the context of other existing infrastructure and industrial/commercial developments in the vicinity. The principle area where changes will be visible will be around the building that is seen behind the electricity pylon in this view.

View 2 On Kellystown Road

Figure 10.5 View 2 (On Kellystown Road) – Proposed

The main changes that can be seen in this view is the increase in the number of roof-mounted exhausts [directly behind the pylon left of the centre of the image] and a change to the roof line that is discernable to the left of that. This is confirmed by the 'redline' image which confirms the location of these features. (See the Appendix to this Chapter for full page reproductions of these images.)

View 3 On the Western Embankment of the Royal Canal

Figure 10.6 View 3 (On the Western Embankment of the Royal Canal) – Existing

The popular walk beside the canal across the viaduct which forms the eastern end of the Rye Water valley has few direct views westward on account of vigorous tree growth. This view from a short section of the walk near the ruined stone structure offers an expansive view. The buildings structures and utility areas have always been coloured in a uniform dark brown to minimise the apparent scale and to remove visual 'scale clues' – as a result it is difficult to discern individual details or modelling within the building mass when seen from distances such as this

View 3 On the Western Embankment of the Royal Canal

Figure 10.7 View 3 (On the Western Embankment of the Royal Canal) – Proposed

The proposed development is visible and discernable – though it does not appear to noticeably increase the visual scale or prominence of the overall composition. The increased horizontality of the tallest sections appears to reduce the prominence of the composition. This is confirmed by the 'redline' image which confirms the location of these features. (See the Appendix to this Chapter for full page reproductions of these images.)

View 4 At Louisa Bridge

Figure 10.8 View 4 (At Louisa Bridge) – Existing

The first view of the Intel lands are seen when travelling westward from this elevated location on the bridge that crosses the railway and canal. This view was selected to determine whether a potential existed for the building to break the skyline. The vegetation that can be seen against the skyline in the middle distance is screening on a mound that was created to visually enclose the development areas.

View 4 At Louisa Bridge

Figure 10.9 View 4 (At Louisa Bridge) – Proposed

There is no visibility of any aspect of the main proposed development when seen from this location. The upper portion of the watertanks are just visible on the right side of the image, this visibility is likely to be fully screened by growing screen vegetation within 24 months.

This is confirmed by the 'redline' image which confirms the location of these features. (See the Appendix to this Chapter for full page reproductions of these images.)

10.5.2 VIEWPOINTS IN THE WIDER LANDSCAPE

Note that where the distance from a structure exceeds about 2km two additional factors need to be taken into consideration.

The first is that at these distances the intervening atmosphere tends to cause most colours to become simplified into lighter and darker shades of grey.

The second is that at these distances there is a need to differentiate between whether an object is 'visible' or 'discernable'. Visibility refers to the theoretical unobstructed line of sight between two objects.

It can be difficult to clearly discern individual objects at distance due to the atmospheric effects mentioned above combined with the fact that all objects occupy an increasingly smaller portion of the field of view.

When examining distant views it is not uncommon to encounter situations where locally intervening topographic features limit distant views. These factors combine to limit the effectiveness of photomontages as evaluation tools.

Accordingly the following viewpoint is described without reference to photomontages.

From elevated portions of the R449 in the vicinity of the junction with the M4 the upper portion of the existing plant is distantly visible. From this distance the new works will not be discernable.

10.5.3 SUMMARY OF LANDSCAPE IMPACTS

The proposed development will be seen in the context of the urbanised fringe of east Kildare where it will conform with the emerging character and appearance. The project will be seen in the context of the other large industrial on the site. The additional visual effects arising will be difficult to discern from those that already occur at this established industrial site.

10.6 DESCRIPTION OF MITIGATION MEASURES

This section describes the measures that have been employed to mitigate landscape and visual impacts. It should be read in conjunction with descriptions of alternatives as well as the Planning Application Report – which includes extensive descriptions of the site design– as well as the architect's accounts of the design approach.

The landscape and visual impacts described here are *residual impacts* that have emerged following consideration of measures to anticipate and avoid adverse impacts.

10.7 RESIDUAL EFFECTS

The proposed development will give rise to effects that will be seen in the context of an established industrial site. Changes to the appearance will be discernable from distant viewing points but will appear minor and will not significantly alter the appearance or character of the area.

11. MATERIAL ASSETS

11.1 INTRODUCTION

On account of the complexity and scale of issues arising the topics normally covered in this chapter have been assessed in separate specialist chapters as follows;-

- Chapter 7 Water and Hydrology – which includes waste water [7.9 and Water Supply 7.16]
- Chapter 12 Waste Management
- Chapter 13 Traffic and Transportation
- As required, a separate Control of Major Accidents Hazards Report has been submitted as part of the Planning Application
- Appendix 11 Material Assets

11.2 OTHER MATERIAL ASSETS

Other Material Assets affected include

11.2.1 ELECTRICAL SUPPLIES

There will be a 20MVA increase required in electrical supply. [The works required for this supply are the subject of a previous planning application.] EirGrid have confirmed that this loading can be supplied without adverse effects on other users within the local or regional network.

4.1.1 EFFICIENT USE OF RESOURCES AND ENERGY

Resource use reduction measures used by Intel include examples of cleaner technology and raw material substitution. This application also focuses on indirect effects including the use of water and energy along with the choice of refrigerants to be used on site. Indirect effects such as the use of natural resources and the measures Intel employs to ensure these resources are used efficiently are outlined.

The management systems in place for the design of wafer fabrication (FAB) facilities and the associated processes ensure that raw material usage and energy use arising from site activities are further reduced at source per unit produced for successive generations of technologies, where possible. The environmental goals of minimisation, substitution and recycling are employed to ensure resource use is minimised and resources are used efficiently.

Raw material conservation, emission and waste reduction are achieved through a combination of:

- Cleaner and more efficient process technology to reduce raw material inputs and to produce lower emissions and waste;
- Material substitution with low toxicity alternatives or those that generate lower emissions such as low volatility chemicals;
- Recycling or recovery of raw materials and waste products.

In addition to chemical and gas consumption minimisation, resource conservation is focused on the efficient use of electricity, gas and water on the site.

The primary energy sources used at the site include natural gas and electricity.

Natural gas is primarily used to operate the on-site boilers which generate hot water. This hot water is used for a number of applications including maintaining the temperature control in the clean-rooms and office buildings on site.

Electricity is used for numerous applications on site. The breakdown of electricity use in the different manufacturing facilities on site varies, but the principle energy uses are as follows:-

- FAB Process Tools
- FAB Utilities (Air Handlers, Exhaust Fans)
- Compressors/Chillers/Cooling Towers
- Nitrogen Plants

Overall Reductions in Energy Usage (Normalised)
The overall reduction in energy usage on site, normalised to production, can be assessed from the Energy Intensity Index (EII) which measures the total energy use divided by production set against a particular baseline year. The graph below shows this Index between 1995 (baseline year set at 1) up to 2009. Overall, it shows that the energy used per unit of production has decreased by about 50% over the past 15 years.

Energy Use Strategy
At a high level, Intel Corporation has set itself the challenge to reduce energy conjunction per chip by 5% per year by 2012 from 2007 levels. This target is shared amongst the sites in accordance with manufacturing plans and potential for reduction.

Energy conservation for the Intel Ireland site as a whole is currently managed through the site's environmental management plan (EMP) that is agreed with the EPA on an annual basis. Each project included in the EMP system has an objective and target. These projects are tracked by the Environmental Department and are detailed in the Annual Environmental Reports (AERs). Over the year from 2001 to 2009, Intel implemented energy conservation measures which resulted in total savings of 85 Million kWhs of electricity and 107 million KWhs of natural gas. The impact of many of these measures will continue to be realised in future years.

Since the mid 2000's, Intel Ireland has piloted, implemented and upgraded a utility monitoring and targeting (M&T) system. Weekly consumption trends are reviewed against best previous performance targets set for the system. This ensures that any energy/water saving projects that have been implemented remain in place and any excursions from normal performance can be detected. The effective and systematic management of this system has been critical to accelerating energy reduction project implementation.

Intel has an established aggressive energy conservation program, with dedicated resources. Corporate funds are specifically made available for implementing energy efficiency measures. The refitted factories will employ the latest technology in manufacturing to reduce energy consumption per unit of production. They will improve the site energy efficiency as measured by Energy Performance Index (EPI) contingent on the site running to projected full capacity for a significant part of the each year.

Since the current IPPC licence was issued in 2005, a number of formal reports have been commissioned by Intel Ireland as required by the licence.

Intel carried out the required Energy Audit over the course of 2006 and submitted a report to the Agency on the 21st December 2006. The report set out the Context of Energy Use, the Energy Management System, Energy Consumption (Electricity, Natural Gas, Oil), an Update on Energy Conservation Projects (Heat Recovery Chillers, Employee Energy Awareness, Awards granted to Intel, Energy Splits, Energy Monitoring and Targeting/Energy Performance Indicators (EPI) as well as Energy Audits. The audit report also outlined a number of potential energy savings projects for evaluation and implementation in subsequent years.
Intel also carried out a review and update of the 2003 CHP study. A copy of the conclusions of the review was submitted to the Agency at the end of July 2006.

This updated study concluded:-

- Energy consumption on site increased inline with the 2003 study even though the site build-out was larger than anticipated at the time of the 2003 study. The energy consumption would have been higher than it actually was but for the implementation of many energy reduction projects;
- The inclusion of Heat Recovery Chillers within the FAB 24-2 project reduced the total amount of heat (by approx 50%) used in FAB 24-2;
- The reduction in the heat loads on-site and the use of heat recovery reduces the opportunity for CHP plant;
- The ratio of required electrical output to heat load demand from a CHP plant has not changed to increase the viability of CHP since 2003. In addition, the location of the heat demand on site would prove disproportionately costly to supply;
- Reliability constraints have not changed, but have become more stringent. The requirement for maintenance of a CHP system will interrupt the electrical supply on site as the electrical distribution system is not designed to allow interruptions.;
- The relatively small heat load of a CHP plant, relative to the electricity load and the financial costs and benefits from installing CHP and the uncertainty (at that time) in relation to the Single Electricity Market (SEM) and the EU Emissions Trading Scheme (EU ETS) increases the financial risks associated with the installation;
- The overall conclusion was that the addition of the two boilers in the FAB 24 Energy Centre did not change the conclusions of the 2003 Report - i.e. CHP is not viable given heat load, reliability constraints, and electricity and natural gas prices;
- The primary factors which affect the most sustainable energy solution at the site include: electricity price, gas price, possible carbon tax and emissions trading regimes and developments in the renewable energy market. Should any of these factors alter significantly, their impact on the most sustainable energy solution for the site should be assessed;
- The most sustainable energy solution, based on the study, is engaging in continued energy conservation activities and continued manufacturing process improvements.

Energy Conservation Progress in recent years

Energy conservation is a continuous focus for the company and is integrated into the business review process.

Thermal Energy

Absolute reductions in the amount of natural gas used on site have been achieved since the 2006. This was achieved by the completion of projects to reduce the demand for thermal heat and from projects which use waste heat instead of thermal heat from the boilers. The most significant of this latter category of project was the installation of Heat Recovery Chillers in the FAB 24 Energy Centre to support the FAB 24-2 Cleanroom. This means that waste heat from the chillers is used to heat the cleanroom instead of being dissipated to atmosphere within the cooling towers, thereby achieves significant gains.

Electricity

Electricity minimization schemes focus on optimizing the electrical efficiency of high use plant as per the EN16001 approach. Many plant items are less efficient when either running at low loadings or on standby. Efficiency gains are planned by operating fewer plant items at higher loading following continuous site reviews. Details on electricity efficiency measures introduced to the site are identified in each AER report.

12. WASTE MANAGEMENT

12.1 INTRODUCTION

This section of the Environmental Impact Statement (EIS) was undertaken by AWN Consulting Limited, on behalf of Intel to assess the impact of the proposed FAB 24 Conversion arising from the generation of waste materials during the construction and operational phases of the proposed development.

The potential impacts and mitigation measures for waste management during both the construction and operational phases of the proposed development are set out in the following sections.

12.2 METHODOLOGY

The assessment of the impacts of the proposed development arising from the generation of waste materials was carried out taking account of the methodology specified in the following guidance documents:

- Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Statements (2002) [1]
- EPA Advice Notes on Current Practice (in the Preparation of EIS) (2003) [2]

A walkover of the site was completed in August 2011 to gain an appreciation of the existing environment and site context.

A review of the operational wastes types currently and historically generated by Intel Ireland was undertaken. This data was used to estimate waste types and quantities that will be generated from the construction and operational phase of the proposed development. An extensive document review was completed to assist in identifying current and future requirements for waste management and included:

National Policies and Strategies such as:

- Changing Our Ways; A Policy Statement on Waste Management, Department of the Environment, Heritage and Local Government (DoEHLG), 1998 [3]
- Preventing and Recycling Waste - Delivering Change, DoEHLG, 2002 [4]
- Making Ireland's Development Sustainable – Review, Assessment and Future Action, World Summit on Sustainable Development, 2002 [5]
- Taking Stock and Moving Forward, DoEHLG, 2004 [6]
- National Strategy on Biodegradable Waste, DoEHLG, 2006 [7]

[1] EPA Guidelines on the Information to be Contained in Environmental Impact Statements, Environmental Publications, 2002.
[2] EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), Environmental Publications, 2003.
[3] Changing Our Ways; A Policy Statement on Waste Management, Department of Environment, Heritage and Local Government, 1998.
[4] Preventing and Recycling Waste - Delivering Change, Department of Environment, Heritage and Local Government, 2002.
[5] Making Ireland's Development Sustainable – Review, Assessment and Future Action, World Summit on Sustainable Development, 2002.
[6] Taking Stock and Moving Forward, Department of Environment, Heritage and Local Government, 2004.
[7] National Strategy on Biodegradable Waste, Department of Environment, Heritage and Local Government, 2006.

- Statutory Instruments (as amended) such as:
  - Waste Management Act 1996 as amended by the Waste Management (Amendment) Act 2001 [8]. Sub-ordinate legislation includes:
    - Waste Management (Facility Permit and Registration) Regulations 2007 as amended 2008 [9]
    - Waste Management (Collection Permit) Regulations 2007 as amended 2008 [10]
    - Waste Management (Packaging) Regulations 2003 [11]
    - Waste Management (Licensing) Regulations 2000 as amended 2002 [12]
    - Waste Management (Planning) Regulations 1997 [13]
    - Waste Management (Landfill Levy) Regulations 2002 [14]
    - Waste Management (Hazardous Waste) Regulations 1998 [15]

- Local Government Act 1994 [16] and regulations

- WEEE Directive 2002/96/EC [17] and regulations

- Protection of the Environment Act 2003 [18]

- Litter Pollution Act 1997 [19]

- Waste Management (Food Waste) Regulations 2009 [20]

- Codes of Practice and Guidelines such as
  - Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects, DoEHLG, 2006
  - Construction and Demolition Waste Management – a handbook for Contractors and Site Managers, FÁS and the Construction Industry Federation, 2002
  - BS 5906:2005 Waste Management in Buildings – Codes of Practice, British Standards, 2005

- Local Authority Plans and Bye-Laws such as:
  - Waste Management Plan for County Kildare, 2005 – 2010 [21]

- Reports and information provided by Intel, which included the following:
  - Extracts from Intel Ireland IPPC Licence Review 2011
  - Drawings supplied by project engineers (Jacobs Engineering) and project architects (CH2MHill) were reviewed as part of this assessment.

12.3 RECEIVING ENVIRONMENT

In terms of waste management, the baseline environment is largely defined by Kildare County Council – as the local authority responsible for setting and administering waste management activities in the area.

[8] Waste Management Act 1996 (S.I. No. 10 of 1996) as amended by the Waste Management (Amendment) Act 2001
[9] Waste Management (Facility Permit and Registration) Regulations, S.I No. 821 of 2007 as amended 2008 (S.I No. 86 of 2008)
[10] Waste Management (Collection Permit) Regulations S.I No. 820 of 2007 as amended 2008 (S.I No 87 of 2008)
[11] Waste Management (Packaging) Regulations 2003 (S.I. No. 61 of 2003)
[12] Waste Management (Licensing) Regulations 2000 (S.I 185 of 2000) as amended 2002 (S.I 336 of 2002)
[13] Waste Management (Planning) Regulations 1997 (S.I. 137 of 1997)
[14] Waste Management (Landfill Levy) Regulations 2002 (S.I 86 of 2002)
[15] Waste Management (Hazardous Waste) Regulations 1998 (S.I 163 of 1998)
[16] Local Government Act 1994 (No. 8 of 1994)
[17] Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE)
[18] Protection of the Environment Act 2003 (No. 27 of 2003)
[19] Litter Pollution Act 1997 (No. 12 of 1997)
[20] Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009)
[21] Waste Management Plan for the County Kildare 2005 – 2010 (2006) prepared by Fehily Timoney & Company on behalf of Kildare County Council.

This is largely governed by the requirements set out in the Waste Management Plan for County Kildare 2005 – 2010. (Note: The existing plan is currently being evaluated under the transposing regulations (S.I. 126 of 2011) of the Waste Framework Directive (2008/98/EC). The Directive states that all plans are to be evaluated and revised by 31 December 2012.)

The current Plan addresses all areas of waste management – from waste prevention and minimisation, to its collection, treatment, recovery and final disposal. The Plan is guided by international, EU and Irish legislation and policy on waste management.

The Plan has set a number of targets for the region. The main targets in relation to the commercial/industrial sector can be summarised as follows:

- Recycling of 35% of household/domestic waste
- Recycling of 35% of commercial/industrial waste
- a diversion of 50% of overall household waste away from landfill,
- a minimum 65% reduction in biodegradable wastes consigned to landfill

12.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

12.4.1 CONSTRUCTION PHASE

Waste Types and Quantities

Waste will be generated from demolition and construction activities. Wastes will include soil/subsoils, concrete, external building cladding, plasterboard, timber, WEEE, packaging. The non-hazardous and hazardous waste streams that will be generated with the predicted quantities for the construction and demolition phase are tabulated in the Appendices to this Chapter of the EIS (see Appendix 12.1).

In addition, approximately 2,500m^3 (circa 3,750 tonnes) of soil/stones will be excavated from an existing berm along the eastern boundary of the site to facilitate construction of 3 no. water tanks and a pump house. It is anticipated that all of this material will be re-used on site during the construction phase of the project and therefore will not require offsite disposal.

Waste Management

A site specific construction and demolition waste management plan (C&D WMP) for the construction phase of the proposed development (see Appendix 12.4) which details the proposed strategy for the management of construction wastes.

12.4.2 OPERATIONAL PHASE

Waste Types

Waste will also be generated during the operational phase of the development from process and non-process related activities. These fall into two main categories – non-hazardous and hazardous waste. Non-hazardous wastes are comprised of inert materials from process activities as well as packaging, office and canteen wastes. Hazardous wastes are comprised of hazardous waste from process activities as well as batteries, lamps and waste oils from the operation of the site.

The manufacturing processes that will be carried out will generate a broad range of wastes including corrosive, solvent, metal and toxic contaminated solids, bulk waste solvents, and other, smaller volume liquid wastes including concentrated metal solutions. The manufacturing processes that will generate the primary process waste streams are illustrated in Figure 12.1.

The non-hazardous and hazardous waste streams that will be generated with the predicted quantities for the operational phase are tabulated in the Appendices to this Chapter (see Appendices 12.2 and 12.3). The tables detail the waste type, EWC code, source of the waste, predicted annual tonnage and the details of the waste service providers currently used for collection and disposal/recovery/recycling of these waste types. The predicted waste types and annual tonnages represent the predicted annual wastes from entire facility.

In the event that Intel proposes to use an alternative suitably permitted/licenced waste contractor for collection or disposal/recovery/recycling of any of these waste types, EPA approval will be sought in advance. Intel only use waste services providers that are approved by the EPA for collection and/or disposal/recovery/recycling of waste from the site.

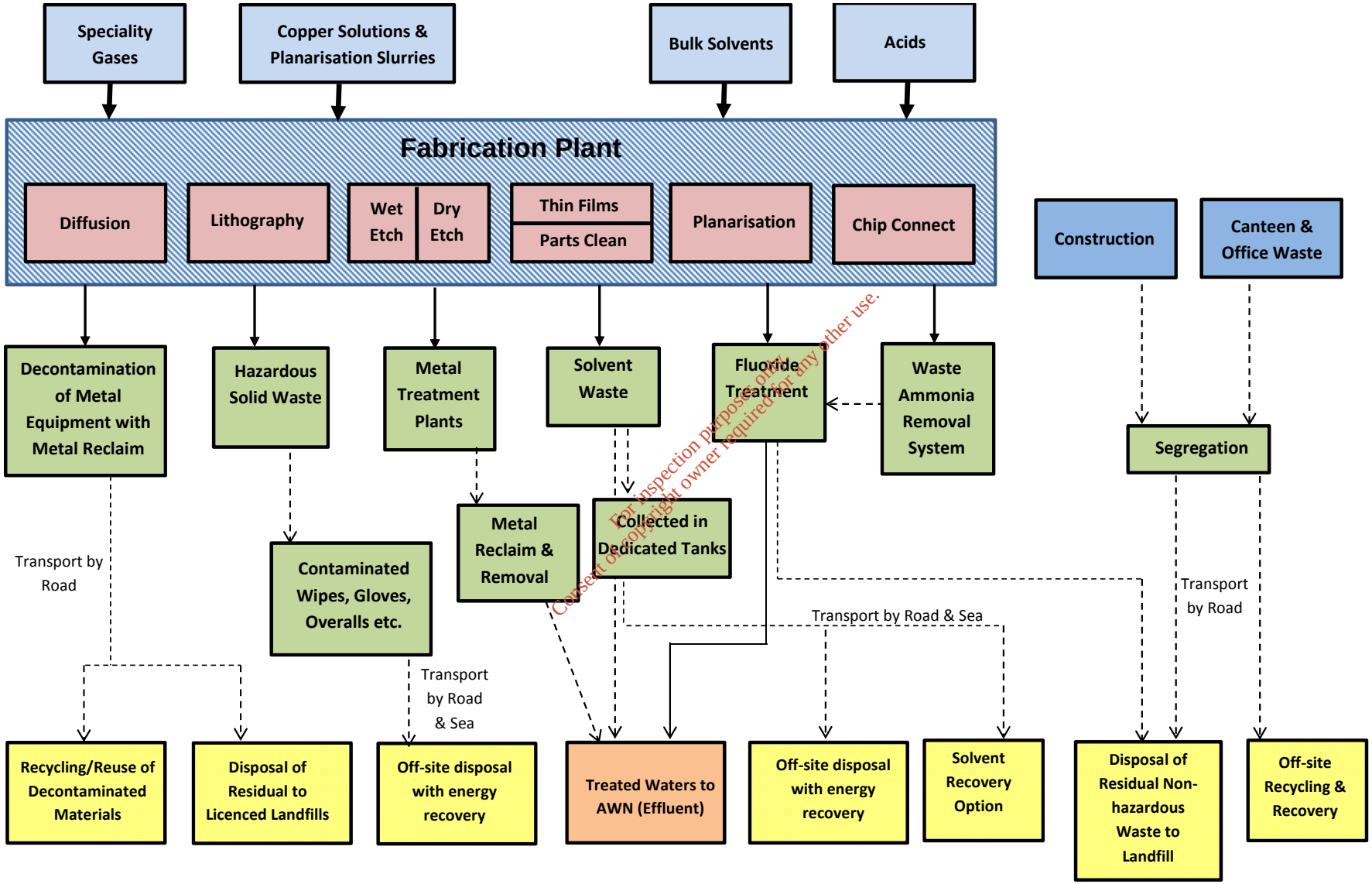


Figure 12.1 Overview of Manufacturing Processes showing Principal Wastes arising

Waste Management

All wastes will be managed in accordance with Intel Ireland's IPPC Licence requirements, EMS, Hazardous Waste Programme Manual and Waste Management Procedures. The mechanism on the Intel site for handling, transporting and disposing of hazardous waste ensures safe and environmentally responsible disposal. Full details of the non-hazardous and hazardous waste streams that will be generated with the predicted quantities for the operational phase are tabulated in the Appendices to this Chapter (see Appendices 12.2 and 12.3).

Intel's procedures for managing the main non-hazardous and hazardous waste types are summarised below.

Non-Hazardous Wastes

Non-hazardous wastes will be segregated using the extensive segregation and recovery infrastructure present on site. The segregated wastes will be transferred off site by Intel's non-hazardous waste contractor (currently Greenstar) for recycling/recovery/reuse or disposal (only where recycling/recovery/reuse cannot be achieved). All of the non-hazardous waste streams will be recycled/recovered/reused with the exception of sludge, filter cake and mixed non-recyclable waste which is disposed of to landfill as recycling/recovery/reuse cannot currently be achieved for these waste streams. Options for recycling/recovery/reuse for these waste streams are currently being explored.

Intel's recycling/recovery target for waste is 80%. Intel continually endeavours to meet or exceed this target. A recycling/recovery/reuse rate of 95% is regularly achieved for non-hazardous waste. Intel's target is well in excess of the recycling target set by the Waste Management Plan for the Kildare Region of 35%.

Hazardous Wastes

Hazardous waste receptacles (bins/drums/fibreboard boxes) will be provided where needed. All hazardous waste receptacles will be labelled to identify the waste stream and will be lined in accordance with Intel's hazardous waste colour coding system. Intel's waste procedure requires the waste generator to (before carrying out a task) review the waste generated and locate the nearest appropriate receptacle to the task or seek the appropriate packaging to dispose of the waste correctly.

All hazardous waste will be packaged into UN certified packaging for waste transportation. When there are sufficient drums/boxes for a load, Intel's appointed hazardous waste contractor (currently Veolia) will pack the drums/boxes into a shipping container and label the container. Veolia will prepare the necessary paperwork and obtain the required approvals before transporting the shipping container offsite for shipment abroad for disposal.

Solid Hazardous Waste

Solid hazardous waste will be either Flammable (Solvent) or Corrosive. The waste will be segregated (into corrosive and solvent) and packed into dedicated bins or UN approved drums or fibreboard boxes. Any solid hazardous waste collected in bins will be subsequently re-packaged into UN approved drums/boxes. The drums/boxes will then be taken to the hazardous waste compound prior to loading onto a shipping container for transportation offsite.

Liquid Waste

Liquid waste will be stored in tanks. When the level of the tank reaches a predetermined level, Veolia will be notified and will prepare the necessary paperwork and obtain the required approvals before transporting the tanker of site. (Note: some liquid wastes will be treated onsite and the treated waters discharged to the AWN.)

Batteries

Prior to disposal, battery terminals/contacts will be taped to prevent contact. All wet cell batteries are double bagged in corrosive waste bags. The batteries will be transferred to dedicated battery boxes for storage pending collection and transfer offsite.

Lamps

Prior to disposal, lamps will be repackaged in their original vendor packaging (where possible) or double bagged in corrosive waste bags and labelled. The batteries will be transferred to dedicated storage contains/coffins for storage pending collection and transfer offsite. If lamps are broken, they will be

treated as sharps and stored in a sharps container and disposed of accordingly. (Note: halogen lamps are non-hazardous for disposal purposes).

Waste oils
Waste oil will arise from the support facility equipment service and specialised tools equipment service (e.g. waste pump oil). Waste oil will be collected in a dedicated storage container which is contained in a bunded area. This waste is sent offsite for recovery.

Hazardous Waste Requiring Decontamination
Some solid hazardous materials may be decontaminated through specific cleaning procedures. This must be approved by Intel EHS. Cleaning materials from the cleaning process will be treated as hazardous waste and will be disposed of accordingly. Once it is verified that the material is deemed to be inert for disposal purposes, it will be segregated into the non-hazardous waste receptacles for collection by Intel's non-hazardous waste contractor.

12.5 POTENTIAL IMPACT

12.5.1 CONSTRUCTION PHASE

The potential impacts of the proposed development, in relation to construction and demolition waste are that the targets outlined in the Waste Management Plan for the Kildare Region will not be achieved.

The use of unlicensed or non-permitted waste contractors could give rise to inappropriate management of waste and result in environmental impacts/pollution.

In addition, if waste is not managed and stored correctly, this may lead to litter or pollution issues on the site or adjacent sites.

12.5.2 OPERATIONAL PHASE

The potential impacts of the proposed development, in relation to waste generated during the operational phase waste are that the targets outlined in the Waste Management Plan for the Kildare Region will not be achieved and would lead to the quantities and volumes of waste described in the previous section being sent to landfill, with low levels of waste segregation.

The use of unlicensed or non-permitted waste contractors could give rise to inappropriate management of waste and result in environmental impacts/pollution.

In addition, if waste is not managed and stored correctly, this may lead to litter or pollution issues on the site or adjacent sites.

12.6 DO NOTHING SCENARIO

The 'Do Nothing' Scenario would be to leave the site as it is currently, which would result in no change or increase in waste production in this area.

12.7 AMELIORATIVE, REMEDIAL OR REDUCTIVE MEASURES

Intel's waste programme in operated in accordance with the Intel site and global EHS (Environmental, Health & Safety) Environmental Policy. Waste management is an integral part of Intel's Environmental Management System (EMS) which is accredited to ISO14001 standard. Intel's EMS ensures continuous improvement in environmental performance. Objectives and targets are set down in Intel's Environmental and Energy Management Programmes (EMPs). Intel's Environmental Policy commits itself to:

'We strive to conserve natural resources through innovative processes and continuous improvement methodologies with the goal of reducing, reusing, recycling, and identifying safer material substitutes or alternatives for our operations. We are committed to designing and manufacturing products that are safe, energy efficient and minimize impact to the environment'.

This commitment forms part of Intel Ireland's business process with senior management providing the driving force to implement changes through the organization and continuous improvement to waste management practices at the site. The on-going development of the waste programme overall aims:

- To minimise waste at source through cleaner technology, enhanced operating procedures and employee awareness;
- To segregate waste that cannot be avoided and maximise recovery, reuse and recycling opportunities; and
- To dispose of the waste in an environmental sensitive manner where recovery options are impractical.

In order to achieve these objectives, the Intel strategy is aimed at developing the following:

- Integration of waste minimisation into the design process to reduce waste at source;
- Strong management and an extensive onsite recycling infrastructure;
- Productive partnerships with contractors;
- Enhanced awareness and training facilities; and
- Involvement with the local community.

Integration of waste minimisation into the design process to reduce waste at source
Intel Ireland works with Intel Corporation and Intel Development at an early stage of design so as to ensure that all waste is reduced where possible. In addition, Intel completes a signoff of all design packages, and any issues with waste are identified in the signoff stage and rectified prior to installation of any waste treatment on-site. Intel Corporation work with tool suppliers to ensure that tools and facility systems are designed to minimise waste where possible.

Strong management and an extensive onsite recycling infrastructure
Management support has ensured that adequate resources have been allocated to implementing an on-site infrastructure to segregate waste to facilitate waste recovery. Intel Ireland has ensured that key legal requirements and goals for waste management have been implemented into waste contracts. This provides a partnership between Intel and its waste contractor to achieve the same set of goals and achieve improvements.

Enhanced awareness and training facilities
Environmental training and awareness classes are considered a mandatory part of the training and development of identified Intel employees on-site. Employees must attend and obtain certification in their relevant subject areas before being qualified to perform certain work related tasks which is subject to periodic recertification. Classes are instructed by qualified personnel on-site or provided by Web Based Training (WBT) software. In the case of Instructor Lead training, the training department co-ordinates and communicates the class schedules on a weekly basis which are conducted in specially designated training rooms throughout the site. Training and awareness classes in relation to waste on the Intel site, include for example: "Environmental Awareness", "Hazardous Waste", "Chemical Handling". In addition, environmental awareness days were held over 2010.

Involvement with the local community
Intel has strong community relations with the local towns, schools and communities. In addition, Intel continues to promote Environmental Awareness in the community by holding environmental recycling days and community driven projects.

The management of wastes during both the construction and operational phases of the proposed development will be undertaken in accordance with waste legislation, national waste policies and strategies, best practice guidance and the Waste Management Plan for the Kildare Region as well as Intel's IPPC licence requirements (IPPC Register No. P0207-03), EMS and waste programmes. The specific mitigation measures for the construction and operational phases of the development are outlined in the following sections.

12.7.1 CONSTRUCTION PHASE

A site specific construction and demolition waste management plan (C&D WMP) for the construction phase of the proposed development (see Appendix 12.4 to this Chapter) has been prepared to ensure effective waste management and recycling of waste generated at the site.

Mitigation measures proposed are summarised below and are described in more detail in the C&D WMP:

- On-site segregation of all waste materials (as detailed in Appendix 12.1 to this Chapter) into appropriate categories including:
  - Topsoil, made ground/fill, sub-soil and bedrock, if encountered (segregated into inert, non-hazardous and hazardous material for disposal in accordance with Council Decision 2003/33/EC);
  - concrete, bricks, tiles, ceramics
  - plasterboard
  - asphalt, tar and tar products
  - metals (mixed ferrous, cladding, high grade stainless steel, low grade stainless steel etc.)
  - hard plastic
  - timber
  - dry recyclables e.g. cardboard, plastic, timber
  - general (non-recyclable) waste

- All waste materials will be stored in skips or other suitable receptacles in a designated area of the site.
- Wherever possible, left over materials (e.g. timber off cuts) and any suitable demolition materials shall be re-used on-site.
- Uncontaminated excavated material (topsoil, sub-soil, etc) will be re-used on site in preference to importation of clean fill.
- If any potentially contaminated material is encountered during the construction works, it will be tested to confirm its contamination status and subsequent management requirements.
- If any excavated material is deemed to be contaminated it will not be re-used on site.
- Hazardous wastes will be managed in accordance with Intel Ireland's IPPC Licence requirements, EMS, Hazardous Waste Programme Manual and Waste Management Procedures.
- All waste leaving site will be recycled, recovered or reused where possible, with the exception of those waste streams were appropriate facilities are currently not available.
- All waste leaving the site will be transported by suitable licensed or permitted contractors and taken to suitably licensed or permitted facilities in full compliance with Local Authority Conditions and in full compliance with the relevant Sections of the Waste Management Act of 1996 (as amended 2001), the Waste Management (Facility Permit & Registration) Regulations of 2007 and the Waste Management (Collection Permit) Regulations of 2007. Details of the permitted/licenced waste contractors that will be used are provided in Appendices 12.2 and 12.3. In the event that Intel proposes to use an alternative suitably permitted/licenced waste contractor for collection and/or disposal/recovery/recycling of any of these waste types, EPA approval will be sought in advance.
- All waste leaving the site will be recorded and copies of relevant documentation maintained.

12.7.2 OPERATIONAL PHASE

Mitigation measures proposed are as follows:

- On-site segregation of all waste materials into appropriate categories including:
  - Sludge
  - Filter Cake
  - Cardboard Packaging
  - Plastic Packaging
  - Mixed Packaging
  - Glass
  - WEEE
  - Mixed C&D (i.e. Concrete, bricks, tiles, ceramics)
  - copper, bronze brass
  - Aluminium
  - Metals

- Paper
- Biodegradable Kitchen & Canteen Waste
- Textiles
- Edible cooking oil and fat
- Timber
- Other Fractions not otherwise Specified (hair nets, booties & gowns)
- Mixed non-recyclable waste
- Bulky municipal waste
- Hazardous process wastes (as detailed in Appendix 12.2 to this Chapter)
- Hazardous non-process wastes (batteries, lamps, waste oil as detailed in Appendix 12.2)

- All waste materials will be stored in bins or other suitable receptacles in a designated, easily accessible area of the site.
- Hazardous wastes will be managed in accordance with Intel Ireland's IPPC Licence requirements, EMS, Hazardous Waste Programme Manual and Waste Management Procedures.
- All waste leaving site will be recycled, recovered or reused where possible, with the exception of those waste streams were appropriate facilities are currently not available.
- All waste leaving the site will be transported by suitable licensed or permitted contractors and taken to suitably licensed facilities. Details of the permitted/licenced waste contractors that will be used are provided in the Appendices to this Chapter (see Appendix 12.2 and 12.3). In the event that Intel proposes to use an alternative suitably permitted/licenced waste contractor for collection and/or disposal/recovery/recycling of any of these waste types, EPA approval will be sought in advance.
- All waste leaving the site will be recorded and copies of relevant documentation maintained.

12.8 PREDICTED IMPACT

12.8.1 CONSTRUCTION PHASE

Provided the C&D Waste Management Plan (which is consistent with Intel's IPPC Licence requirements, EMS and waste management procedures) is implemented and a high rate of reuse, recycling and recovery is achieved, the predicted impact of the demolition and construction phase on the environment will be short term and imperceptible.

12.8.2 OPERATIONAL PHASE

The mitigation measures detailed in 12.7.2 will ensure the waste arising from the development is dealt with in compliance with the provisions of the Waste Management Acts 1996 - 2008, and associated Regulations, the Litter Act of 1997 and the Waste Management Plan for the Kildare Region 2005 – 2010 as well as Intel's IPPC Licence requirements, EMS and waste management procedures and achieve optimum levels of waste reduction, re-use and recycling. The predicted impact of the operational phase will be long term and imperceptible.

13. TRAFFIC AND TRANSPORTATION

13.1 INTRODUCTION

Jacobs has been commissioned to undertake a Traffic Impact Assessment to support the planning submission associated with development of Fabrication Unit 2 (FAB 24) at the Intel site at Leixlip, to the west of Dublin.

This report considers the traffic impacts relating to the construction and operation of the proposed development.

13.2 OUTLINE METHODOLOGY

Traffic data has been collected at key locations on the road network adjacent to the Intel site. This data along with traffic projections relating to the proposed development have been used to develop forecast baseline and worst case traffic scenarios.

The operation of the adjacent road network has been modelled using microsimulation software to evaluate the impacts on the network performance from the additional development.

The assessment methodology is as follows:

- Review existing site operation;
- Establish the traffic baseline;
- Identify the observed traffic flows
- Uplift the observed traffic flows to typical levels
- Establish trip generation and re-assignment relating to the FAB 24 development; and
- Assess network operation and identify any mitigation requirements.

The operational assessment considers the potential impacts of increased traffic demand on the adjacent road network to the site in the morning and evening peak hour periods. In order to provide a robust assessment, the traffic impacts associated with the period of construction requiring the highest level of construction staff on site at any time has been considered.

Traffic levels following the construction period are forecast to reduce to a lower level than as currently observed. The post construction situation has therefore not been included within this assessment as there will be a negligible impact.

Consideration of internal traffic movements and the impacts of the development proposals on operation within the site are not included within this review.

13.3 EXISTING SITE OPERATION

13.3.1 EXISTING SITE LOCATION

The Intel site is located to the west of Leixlip in north-east County Kildare, to the west of Dublin. The site is bounded to the west by Kellystown Lane, to the south by the R148 Maynooth Road, to the east by the Royal Canal Way and to the north by agricultural land. The location plan is shown in **Figure 13.1**.

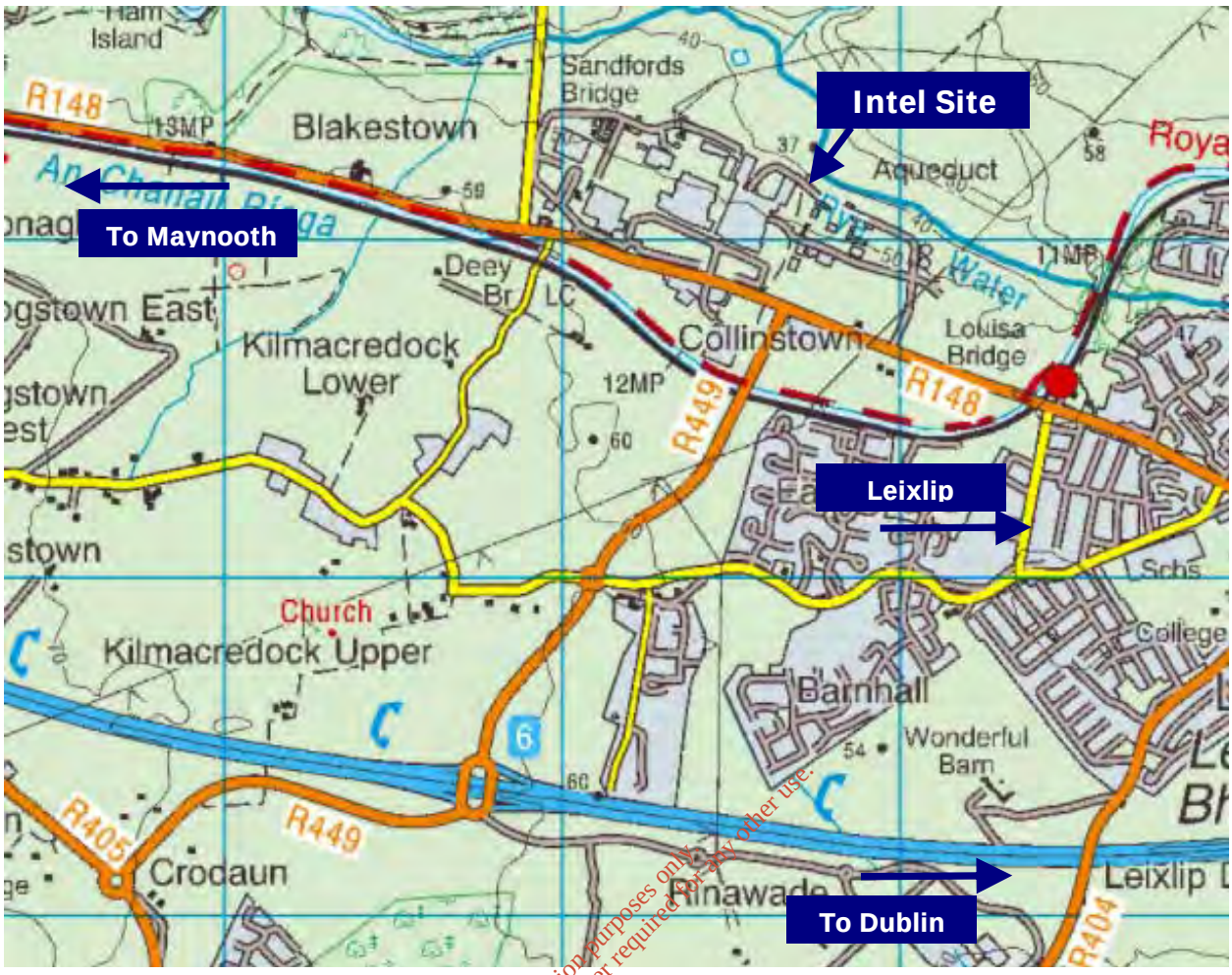


Figure 13.1 Site and Road Network Overview

13.3.2 WALKING AND CYCLING LINKS

Footway and off street cycle path provision is provided in both directions on the R449. Footways and on street cycle lanes are also provided on the R148 in both directions. Signal controlled crossing facilities across the R148 are provided at the three Intel Access Junctions. This provision facilitates safe access for pedestrians and cyclists travelling between the site and local communities including Leixlip.

13.3.3 PUBLIC TRANSPORT

Bus Services

The Dublin Bus Service 66, runs between Dublin and Maynooth, stopping near the main entrance of the Intel site at Collinstown House and towards the western end of the site at Blakestown Cross. Service frequency is typically 2 services per hour on weekdays and the service is estimated to take just over 30 minutes to travel between Dublin City Centre and Leixlip (subject to traffic conditions).

Intel also provide a shuttle bus service, in conjunction with Hewlett Packard, which links the Intel site to the three main train stations, including Maynooth, Hazel Hatch and Louisa Bridge. The shuttle bus also services local housing areas in close proximity to the site. Intel review the shuttle bus timetable every 6 months to ensure that services are integrated with changes to local train times.

Train Services

The Intel site is located 0.6 miles away from Leixlip Louisa Bridge train station, which is approximately 10 to 15 minutes walking distance from the Main Intel site entrance. The Leixlip Louisa Bridge station is on the Western Suburban Route, with services running between Dublin Connelly Station and Sligo at regular intervals.

Maynooth Station which is located approximately 3.3 miles from the Intel site, is out with reasonable commutable walking distance, however, it provides a connection to the Dublin – Sligo Intercity rail

service and is on the Western Suburban Route. The Intel shuttle bus provides a link between the Intel site and Maynooth Station.

Hazelhatch Station is located in Hazelhatch about 4.7 miles to the south of Leixlip and provides a link to the South West Commuter Service and the Dublin – Galway Intercity Service. The Intel shuttle bus provides a service between the Intel site and Hazelhatch Station.

13.3.4 MOBILITY MANAGEMENT PLANS

Intel use a Mobility Management Plan to support and encourage staff and contractors to use sustainable transport modes when travelling to and from the site. The plan is reviewed and updated on a regular basis and includes various methods to help staff mobility such as carpool groups, bicycle user groups and promotion of public transport service and timetable information.

13.3.5 VEHICULAR ACCESS

Trips to and from the Intel site are made primarily via the M4 Junction 2a and the R449, however some trips are also made via the R148 East and R148 West.

There are 3 junctions that currently provide vehicle access to the site via the R148 Maynooth Road:

- West Intel Access – Signal controlled T-junction with a separate right-turn lane on the R148 for traffic turning right into the site, operating on a vehicle detection signal plan;
- Main Intel Access – Signal controlled 4-arm junction with a separate right turn lane on the R148 for right turning traffic into the site, operating on a vehicle detection signal plan. The junction is located such that there is a fourth arm providing access to land on the south of the R148; and
- East Intel Access – Signal controlled 4-arm junction, operating on a vehicle detection signal plan.

The location of these junctions is shown in Figure 13.2 below:

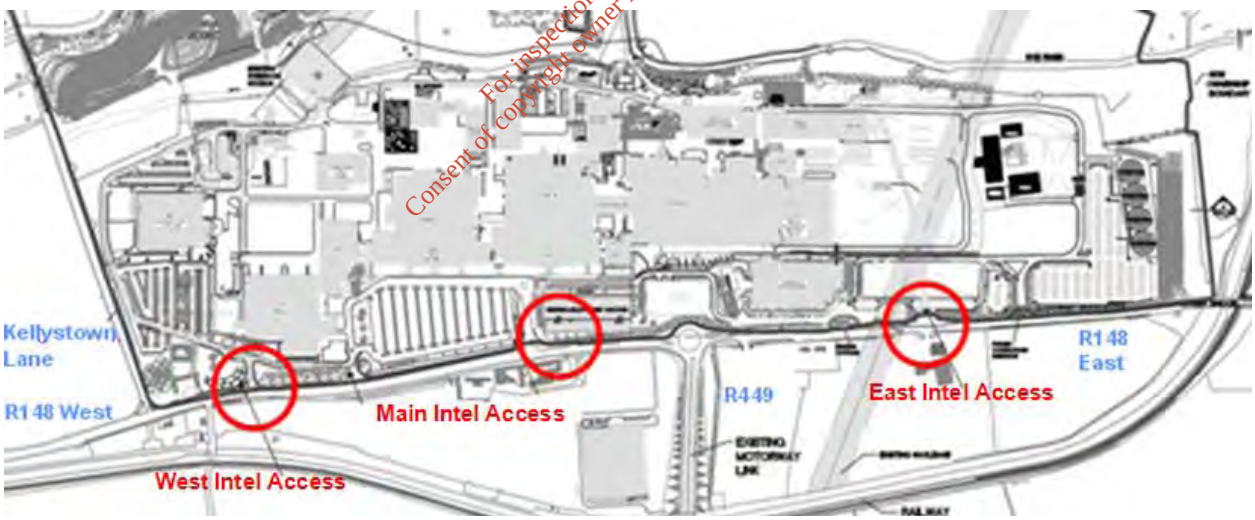


Figure 13.2 Intel Access Junctions

13.3.6 CURRENT STAFFING AND SHIFT PATTERNS

The specific levels of staff working at the Intel site vary on a day to basis; however the daily staff level at the time of this assessment was approximately 3,850. It is expected that this figure will reduce as current ongoing construction activities are completed.

On-site staff are currently made up of four groups as follows:

- Permanent Intel Staff;
- Contingency Workers (Non-construction support staff from other organisations);
- Construction Management Staff; and

- Construction Staff

Details of the existing weekday shift patterns worked by each staff group are detailed in **Table 13.1** below:

Staff Category	Approximate Shift Pattern
Permanent 08:00 to 16:30	08:00 to 16:30
	07:00 to 19:00 / 19:00 to 07:00
Contingency Workers (CW)	08:00 to 16:30
Construction Management	Start between 06:00 and 08:00 and finish between 17:00 and 19:00
Construction	Start between 06:00 and 08:00 and finish between 17:00 and 19:00

Table 13.1 Current Weekday Shift Patterns

The shift start times are not currently rigid, as there is some flexibility in both the start and end times, which is reflected in observed entry and exit traffic counts. As such, some staff are noted to work outside of the shift times outlined in Table 2-A. In addition, changing requirements on construction projects and site usage can also result in a degree of variability outside of the construction shift times. The figures and shift patterns within Table 2-A are therefore considered to vary to a degree, however do provide a sound basis for the review.

13.3.7 CURRENT MODE SPLIT

Based on a recent survey undertaken by Intel, the current proportion of staff driving to work by car is 83%. This proportion is assumed to be the same for all groups of staff.

13.3.8 CURRENT TRIP DEMAND

Based on current staffing levels and mode share, the existing weekday vehicle trip demand to and from the Intel site is estimated to be approximately 3,200. These trips can be split by shift as presented in **Table 13.2**:

Shift	Percentage of Total Trips To / From Intel Site
08:00 to 16:30	42%
07:00 to 19:00 / 19:00 to 07:00	8%
Between 06:00 and 08:00 to Between 17:00 and 19:00	50%

Table 13.2 Current Trip Demand by Shift Period

There will be a degree of day to day fluctuation in the levels within Table 2-B, these will be primarily due to the influence of various factors such as variation in the day to day levels of contingency staff, staff holidays and sick leave.

13.3.9 CAR PARKING

There are several existing car parking areas spread throughout the site as illustrated in **Figure 13-3** overleaf:

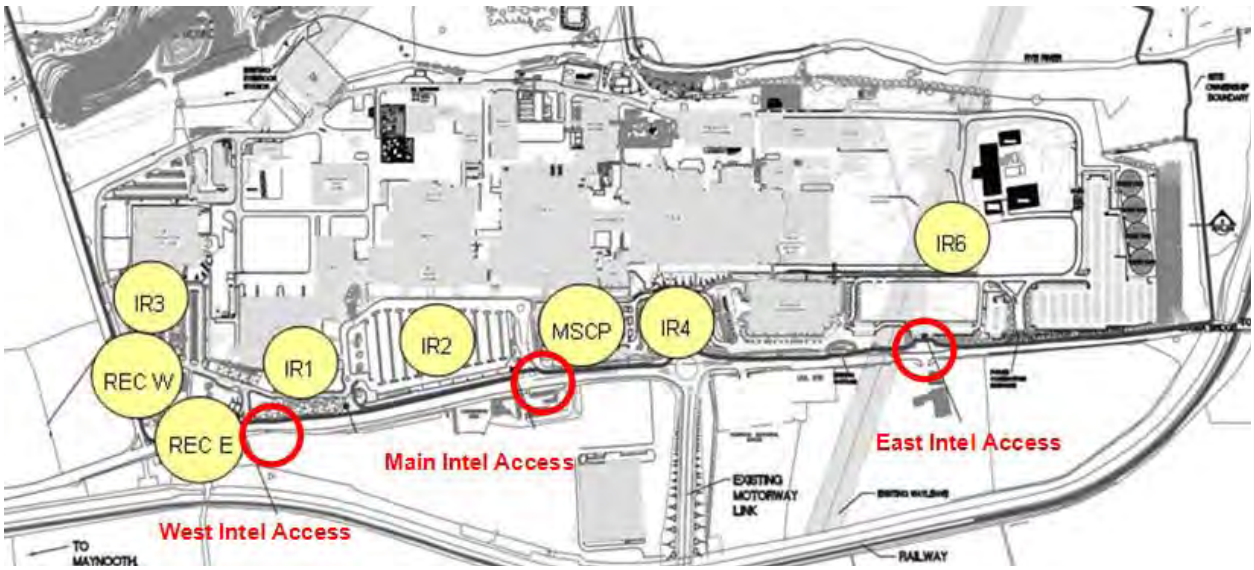


Figure 13.3 Current Car Parking Facilities

Car park surveys have been undertaken by Intel throughout 2011 and indicate that current parking demand is accommodated within the available provision. The majority of car parks within the Intel site can be accessed via each of the three identified access junctions.

Based on discussions with Intel, the following assumptions are considered appropriate for the purposes of this review:

- Permanent staff primarily use the Main Intel Junction, however some permanent staff also use the East and West Intel Junctions to enter / exit the site;
- CW staff primarily use the Main Intel Junction to enter / exit the site;
- Current levels of construction staff primarily use the West Intel Junction, however some construction staff also use the East Intel Junction to enter / exit the site; and
- Construction Management staff primarily use the Main Intel Junction to enter / exit the site.

13.4 DEVELOPMENT PROPOSALS

The FAB 24 development consists of a localised conversion of a module to the east of the Intel site to facilitate future working requirements. The construction period for this facility is expected to be approximately two years (2011 to 2013). It is anticipated that varying levels of construction staff will be present on site throughout this period.

Access to the development will be gained through the signal controlled East Intel Access from the R148. The requirement to accommodate the construction staff in car parks accessed via the East Intel Junction will result in the need for some existing permanent staff to relocate to other car parks, which will be accessed via the Main Intel Junction.

Additional construction management staff will be required during the construction period. These staff will access other parking facilities within the site via the Main Intel Access.

13.5 BASELINE TRAFFIC CONDITIONS

In order to suitably assess the potential traffic impacts of the proposed FAB 24 development, the baseline traffic conditions were first established on the road network adjacent to the site.

To achieve this, the following steps were undertaken:

1. Collect traffic data and establish existing traffic movements on the road network adjacent to the site;
2. Uplift observed traffic flows to reflect typical, non school holiday conditions;

3. Validate traffic flows to and from the site against current staffing levels and mode share; and

13.5.1 OBSERVED TRAFFIC FLOWS

A series of classified traffic surveys were commissioned during August and September 2011 to establish existing traffic conditions at the Intel site and on the adjacent road network. Junction turning count and queue length observations were made at 15 minute intervals. Further details of these surveys are presented in **Table 13.3** below:

Location	Data Type	Date	Time Period
West Intel Junction	JTC / Queue Lengths	11 Aug 2011	06:00 to 09:00 and 16:00 to 18:30
Main Intel Junction	JTC / Queue Lengths	23 Aug 2011	06:00 to 19:00
East Intel Junction	JTC / Queue Lengths	23 Aug 2011	06:00 to 19:00
R148 / R449 Roundabout	JTC / Queue Lengths	23 Aug 2011	06:00 to 19:00
R449 Roundabout	JTC / Queue Lengths	23 Aug 2011	06:00 to 19:00
R148 / Kellystown Lane	JTC / Queue Lengths	23 Aug 2011	06:00 to 19:00
R449 (just south of R148 Roundabout)	Link Count	23 Aug to 9th September 2011	24 hr

Table 13.3 Traffic Survey Details

Origin and destination data has not been gathered, however a review of the traffic volume survey data indicates that approximately 51% of trips travelling to and from the Intel site use the R449 (towards the M4), 18% use the R148 West, 15% use the R148 East and 16% use Kellystown Lane.

Although there is some minor variation in peak traffic demand by origin; the current AM peak hour at the site and on the adjacent road network was observed to be 07:00 to 08:00. The current PM peak hour was observed to be 17:15 to 18:15.

Based on the peak hour periods identified and the existing staff shift start and finish times (**Section 13.3.6**), the survey data was used to establish the following 3 hour traffic model periods:

- AM Period, 06:00 – 09:00; and
- PM Period, 16:00 – 19:00.

These time periods were considered appropriate to provide a suitable basis to evaluate the FAB 24 peak traffic impacts, on the basis that any shifts in peak demand resulting from the development would take place within these timeframes.

Traffic flow diagrams for the observed AM and PM Periods are included in Appendix 13.2 to this Chapter.

13.5.2 UPLIFT TO REFLECT TYPICAL CONDITIONS

The junction turning counts used to inform these traffic model periods were undertaken during the summer school holiday period. The link count on the R449 was therefore put in place for an extended period encompassing both school holiday and term time, to establish any variance in traffic levels.

A review of the survey data collected from the link count indicated that weekday traffic levels were approximately 1.4% higher during the term time period. As such, the flows within the defined AM and PM periods were universally uplifted by this factor to reflect typical conditions.

No further adjustments were made to the traffic flows to take account of monthly seasonality. Traffic demand during September (school term time) are typically high in relation to at other times through the year. As such this is considered to provide a robust basis to inform the operational assessment. Traffic flow diagrams reflecting typical conditions for the AM and PM Periods are included in Appendix 13.3 to this Chapter.

13.5.3 VALIDATION AGAINST INTEL STAFF / TRIP NUMBERS

A comparison of the typical AM (06:00 – 09:00) and PM (16:00 – 19:00) period traffic flows was undertaken against the known staff and trips numbers (based on mode share levels) to validate their suitability in reflecting current site traffic conditions.

This comparison is illustrated in **Table 13.4** below.

Movement	Trips To / From Intel Site (per direction)	
	Based on Staff Numbers / Mode Share	Based on Uplifted Observed
AM Inbound	3,201	3,206
PM Outbound	3,201	2,510
PM Outbound (-259)	2,942	2,510

Table 13.4 Total Intel Site Arrivals and Departures

The AM period encompasses all of the existing staff shift start times as detailed in **Section 13.3.6**. Inbound observed movements are of a similar level to those projected based on staff numbers and mode share data provided by Intel.

The PM Period encompasses all shift end times with the exception of permanent shift staff that finish at 19:00. Based on the trip numbers outlined in **Section 13.3.8**, approximately 259 staff currently work this shift on a typical weekday. These staff trips would therefore not have been observed within the defined PM Period.

Similarly, it is expected that some construction trips will have departed the site after 19:00 dependent on the construction requirements on that date.

Therefore although the observed PM period traffic demand from the site is lower than what would be expected from the staff numbers and mode share data provided by Intel, the difference can be attributed to the factors detailed above.

It should also be recognised that as the network is observed to operate within capacity at present, Intel do not use any particular mechanisms for enforcing shift start and end times to manage delay on the adjacent road network. As such, it is likely that on the survey dates some staff will have departed the site at times that do not correlate directly with the prescribed existing shift patterns.

Intel have confirmed that if the proposed development does not take place, traffic levels to and from the site in the future are expected to be similar to existing levels.

The typical traffic levels (as presented in Appendix 13.2 to this Chapter) have therefore been used as an 'Operational Baseline' to provide an appropriate basis for evaluating the weekday peak traffic impacts of FAB 24 during the defined timeframes established.

13.6 DEVELOPMENT TRIP GENERATION AND ASSIGNMENT

A number of changes in travel demand to and from the site are expected to occur as part of the FAB 24 development. These changes include the generation of additional trips and the appropriate relocation of a proportion of existing trips.

13.6.1 TRIP GENERATION

Intel has provided details of future employment and contractor levels. Traffic demand during FAB 24 construction is expected to peak for a limited time during the defined construction period (2011 to 2013), however for the purpose of the operational assessment the highest potential level has been assumed.

Intel will specify to sub-contractors a requirement to achieve mode share of no greater than 65% car drivers during the construction period of FAB 24. The Mobility Plan will be updated accordingly as part of

its regular ongoing review. This could be achieved through various means including increased public transport usage, car drop offs and in particular for construction staff, increased car sharing. The figures provided in **Table 13-5** reflect this proposal.

For the purpose of this assessment no background traffic growth has been applied in the development of the Operational Baseline or Operational Worst Case traffic scenarios. This is considered appropriate based on the following factors:

- General trends of minimal traffic growth due to the current economic climate;
- The proposed construction period (length and proximity to current year) limiting potential for growth from observed levels; and
- Future traffic growth on this part of the road network will be largely driven by changes in Intel based trips, which are fully considered within this assessment.

Based on the staff levels provided by Intel, the public transport and car share levels are applied to produce the likely vehicle trip levels. To demonstrate the additional traffic demand relating to the FAB 24 development, the forecast traffic projections were compared against the operational baseline demand. These projections also consider forecast changes in travel demand relating to other ongoing projects at the Intel site. This comparison is presented in **Table 13-5** below.

Traffic Type	Trips To / From Intel Site (per direction)		
	Operation Baseline (trips)	Operation Worst Case (trips)	Difference (trips)
Total Site Traffic	3,201	4,134	+933

Table 13.5 FAB 24 Trip Generation

A total of 933 additional inbound and outbound trips are forecast at the point of maximum traffic demand during the construction of FAB 24. The majority of these additional trips are construction based (655 construction and 93 construction management) with the remainder being an increase in permanent staff trips (143 regular week and 42 shift).

Additional Construction Trips

Additional construction staff trips are forecast to travel to and from the site during the peak period of construction of FAB 24. It is proposed that these additional construction trips would park in close proximity to the FAB 24 unit in the east of the Intel site via the East Intel Access.

Additional construction management trips are also forecast to travel to and from the site during the peak period of construction of FAB 24. It is proposed that these additional trips will use the Main Intel Junction in line with existing construction management staff.

These trips have been added to the network based on existing trip distributions at each junction. This adjustment is presented in Appendix 13.4 to this Chapter.

Construction trips currently parking in the west of the site and using the West Intel Access will continue to do so.

To support the application and minimise the effect of this additional traffic, all construction staff shift start and finish times (existing and new staff) will be staggered so as to appropriately manage travel demand to and from the site.

At present, Intel construction staff typically work one of three shift patterns. However during the FAB 24 construction period, construction staff (including management) will work on one of four shift patterns, based on their particular trade group. Intel will take appropriate measures to ensure trade groups adhere to these start / finish times during this period of high demand.

Construction shifts will be staggered at 30 minute intervals as follows:

Trade Group	% of Total Construction Staff	Number of Trips (per direction)	Shift Start / End
A	30%	711	07:00 – 17:00
B1	25%	592	07:30 – 17:30
B2	25%	592	08:00 – 18:00
C	20%	474	08:30 – 18:30
Total	100%	2,369	

Table 13.6 Proposed Construction Staff Shift Details

As noted previously, changing demands of construction projects on site can result in the requirement for some construction staff to temporarily work shifts extending outside of the defined PM Period. This is not considered within this assessment; however spreading of some trips would only lessen the potential traffic impacts.

Arrival and departure profiles for each shift have been developed. Discussions with Intel have highlighted that primarily due to the size of the site:

- Staff are likely to arrive and depart within a 30 minute period of shift start and end times; and
- Peak demand is expected to be approximately 15 minutes before shift start times and 15 minutes after shift end times.

Arrival and departure profiles were subsequently developed to reflect these discussion points. The profiles are assumed to be the same for each of the four construction shifts.

Arrival Profile		Departure Profile	
Time	**% of Trips**	**Time**	**% of Trips**
06:30	5%	17:00 (Finish)	15%
06:35	15%	17:05	20%
06:40	20%	17:10	25%
06:45	25%	17:15	20%
06:50	20%	17:20	15%
06:55	15%	17:25	5%
	100%		100%

Table 13.7 Construction Arrival and Departure Profiles

Additional Permanent Staff Trips

Some additional permanent staff trips are forecast to travel to and from the Intel site at the point of highest demand (FAB 24). These additional trips will access the site via the Main Intel Junction and were distributed on the network according to the existing trip distribution at each junction. See Appendix 13.5 to this Chapter.

Permanent staff shift times for new staff will be the same as those currently in use. As the Main Intel Junction is assumed to be primarily used by permanent employees at present, existing arrival and departure profiles at this junction have been applied to these new trips.

13.6.2 EXISTING TRIP RE-ASSIGNMENT

At present the IR6 car parks within the Intel site are used by permanent employees. These facilities are located towards the east of the site (**see Figure 13.3**) and are assumed to be accessed via the East Intel Junction.

In order to accommodate the new construction traffic and minimise the impacts of additional construction demand to and from the East Intel Junction during FAB 24 construction, existing permanent staff trips travelling to and from IR6 car parks via the East Intel Junction will be required to re-locate to other car parking facilities within the site via the Main Intel junction.

A review of parking levels within the IR6 car parks during May, June and July 2011 indicated average weekday occupancy of around 360 vehicles per day.

Car Park	Survey Date				
	14 July 11	30 June 11	9 June 11	26 May 11	12 May 11
IR6 SW	183	185	184	183	185
IR6 NW	152	159	158	135	138
IR6 NE	25	26	28	27	33
Total	**360**	**370**	**370**	**345**	**356**

Table 13.8 IR6 Car Park Occupancy Levels

A review of the junction turning count survey data (August 2011, see Appendix 13.2) identified the following movements at the East Intel Junction:

- Inbound (AM Peak Period) - 469 trips
- Outbound (AM Peak Period) - 102 trips
- Outbound (PM Peak Period) - 338 trips
- Inbound (PM Peak Period) - 103 trips

As the AM Period encompasses all permanent employee start times (regular and shift), the observed inbound flow and the car park occupancy check were used to establish that 360 of the AM inbound movements were permanent staff, whilst the remaining 109 were assumed to be construction related trips.

Assuming the same number of construction trips (109) departing the East Intel Access Junction in the PM period, the remaining outbound trips from this junction (228) should be permanent staff trips. This level is lower than as observed in the AM period as the PM period does not encompass the shift end time of some permanent staff that finish their shift at 19:00.

The traffic flows were not collected on the same date(s) as the car park surveys were undertaken. However the datasets are considered to provide a comparable representation of typical car park occupancy levels and junction turning movements. It is understood that no significant changes in site operation took place during the intervening period.

Existing departure and arrival profiles as observed at the East Intel Access Junction, and at each other local junction were used to re-distribute these trips to the and from the Main Intel Access.

These re-assignment changes are included in Appendix 13.6 to this Chapter.

All other existing trips will continue to travel via the same routes, access the Intel site via the same junction and arrive and depart in line with existing profiles during the construction of FAB 24.

13.7 OPERATIONAL ASSESSMENT

A microsimulation model was developed using standard Paramics software to undertake an operational assessment. This review includes a model of both the existing conditions and potential operation under the highest construction demand period of the proposed FAB 24 development. The expected change in traffic demand and assignment due to the development during the AM and PM peak periods is based on the assumptions outlined in **Section 13.6**. Operation during Off-Peak periods is not expected to be impacted by the proposals and therefore has not been tested.

Details relating to the development of the microsimulation model including details of the 'network extents', 'model zonal structure' and 'geometric parameters' are presented in Appendix 13.8 to this Chapter

13.7.1 OPERATIONAL TESTING SCENARIOS

To suitably evaluate the traffic impacts of the FAB 24 development, the following traffic scenarios were assessed:

- Observed;

- Operational Baseline; and
- FAB 24 Worst Case.

Demand matrices were developed to represent the various zone to zone traffic movements in the study area based on the observed traffic patterns across the defined AM (06:00 – 09:00) and PM (16:00 – 19:00) peak periods. Matrices were disaggregated by vehicle class and applied by 5 minute time intervals. Appropriate adjustments were made to reflect each traffic scenarios as outlined in **Section 13.6**.

Impacts on forecast maximum queue lengths were considered in the operational assessment. It should be noted that these forecasts present maximum levels and as such are not expected to be present throughout the entire peak periods.

Journey times were also considered and these present forecast average journey time estimates during the peak periods.

Traffic Modelling Assessment – 2011 Observed Scenario
In order to establish the suitability of the microsimulation model to evaluate the traffic impacts of the FAB 24 development proposals, a 2011 observed model was developed to accurately reflect on site operation as currently observed. A summary of this observed traffic scenario is presented in Appendix 13.1.

Comparison of the model traffic operation against observed queue lengths and turning flow data was undertaken. The model was demonstrated to calibrate and validate against these indicators and was therefore established as a suitable tool for assessing the traffic impacts of FAB 24. Appendix 13.9 includes the calibration and validation statistics.

Traffic Modelling Assessment – 2011 Operational Baseline
The Operational Baseline was developed to provide a comparative traffic scenario to assess the impacts of the FAB 24 development proposals.

The Operational Baseline reflects typical traffic conditions assuming the FAB 24 development does not proceed. Traffic operation under this scenario was forecast by the microsimulation model to be similar to as observed.

Traffic Modelling Assessment – FAB 24 Scenario
Demand matrices were developed to reflect the forecast highest demand traffic conditions (FAB 24) as outlined in **Section 13.6**.

Initial testing forecasted significant queuing and levels of delay on the road network adjacent to the site under this worst case traffic scenario. This was primarily a result of the existing detection loop system in operation at the three Intel Access Junctions which proved unsuitable for effectively managing this additional demand.

A series of revised fixed signal plans were developed and included in the model for the West, Main and East Intel Junctions in order to better manage the level of queuing on the local road network. No changes were made to the junction form at any location.

Implementation of fixed timings resulted in improved network operation, with queuing in the AM peak period reduced to acceptable levels. However in the PM peak, queuing on the R148 East approach to the R449 Roundabout extended beyond the LIDL access Junction which was considered undesirable.

This was a result of high levels of exiting traffic from the West and Main Intel Junctions having priority at the R449 Roundabout (as it heads south towards the motorway) over left turning traffic from the R148 East.

To mitigate this queuing and maintain safe access in and out of LIDL for right turning traffic, the signal settings at the West and Main Intel junctions were adjusted to include outbound left turn movements within the adopted signal plan. This allowed for greater control over exiting traffic from the site and the ability to prioritise the operation of the local road network by queuing traffic internally within the Intel site.

A summary of the AM peak maximum queue lengths for the Operational Baseline and FAB 24 traffic scenarios are presented in **Table 13.9**.

Junction	Approach	AM Peak Maximum Queue Length (vehicles)		
		Op. Baseline	FAB 24	Difference
West Intel Junction	R148 West	5	7	+2
	R148 East	9	15	+6
	Intel Access	2	2	-
Main Intel Junction	R148 West	11	10	-1
	R148 East	14	16	+2
	Intel Access	3	10	+7
R148 / R449 Roundabout	R148 West	7	8	+1
	R148 East	6	5	-1
	R449	13	53	+40
East Intel Junction	R148 West	7	4	-3
	R148 East	8	7	-1
	Intel Access	4	0	-4
R449 / Kilmacredock / R449 / Easton Roundabout	R449 North	2	3	+1
	R449 South	5	15	+10
	Kilmacredock	2	2	-
	Easton	5	5	-

Table 13.9 Operational Baseline v FAB 24 Maximum Queue Length (vehicles) – AM Peak

The most significant difference in queuing results between the Operational Baseline and FAB 24 scenarios in the AM peak period is forecast on the R449 nearside approach to the R148 roundabout junction. The maximum queue length is forecast to increase from 13 vehicles in the operational baseline to 53 vehicles in the FAB 24 scenario. Other queue lengths are expected to remain comparable between the two traffic scenarios.

A summary of the PM peak maximum queue lengths for the Operational Baseline and FAB 24 traffic scenarios are presented in **Table 13.10**.

Junction	Approach	PM Peak Maximum Queue Length (vehicles)		
		Op. Baseline	FAB 24	Difference
West Intel Junction	R148 West	10	5	-5
	R148 East	6	14	+8
	Intel Access	9	93	+84
Main Intel Junction	R148 West	9	12	+3
	R148 East	6	9	+3
	Intel Access	3	44	+41
R148 / R449 Roundabout	R148 West	9	10	+1
	R148 East	9	35	+26
	R449	5	7	+2
East Intel Junction	R148 West	28	10	-18
	R148 East	18	8	-10
	Intel Access	3	56	+53
R449 / Kilmacredock / R449 / Easton Roundabout	R449 North	7	11	+4
	R449 South	3	3	-
	Kilmacredock	2	2	-
	Easton	5	8	+3

Table 13.10 Operational Baseline v FAB 24 Maximum Queue Length (vehicles) – PM Peak

Maximum queue lengths on each of the exit arms from the site have increased significantly during the PM peak period.

The most significant change on the local road network is forecast on the R149 east approach to the roundabout junction with the R449. The maximum queue length is expected to increase from 9 vehicles in the Operational Baseline to approximately 35 vehicles under the FAB 24 traffic scenario. This level of queuing can be accommodated within the existing infrastructure capacity without blocking the LIDL access for any significant period of time.

Diagrams illustrating the forecast maximum queue lengths for FAB 24 are included in Appendix 13.10 to this Chapter.

Average queue length forecasts are not discussed within the report, however are included in Appendix 13.11. These forecasts represent the predicted average levels of queuing across the defined peak periods.

The impacts of the forecast queuing on journeys times for non-Intel traffic is expected to be relatively minimal given the changes made to the signal controlled junctions. A summary comparison of modelled journey times for the Operational Baseline and FAB 24 traffic scenarios are presented in **Table 13.11** below.

Route	AM Peak Period Journey Times (mins:secs)		
	Op. Baseline	FAB 24	Difference
R449 South to R148 East	02:19	02:24	**+00:05**
R449 South to R148 West	02:49	04:13	**+01:24**
R148 East to R148 West	02:10	02:19	**+00:09**
R148 West to R148 East	02:19	02:48	**+00:29**
R449 South to West Intel Access	02:43	04:20	**+01:37**
R449 South to Main Intel Access	02:04	03:59	**+01:55**
R449 South to East Intel Access	02:19	02:23	**+00:04**

Table 13.11 Operational Baseline v FAB 24 Average Journey Time Results – AM Peak

Results from **Table 13.11** indicate that generally average journey times along the R148 and R449 routes are expected to remain largely similar between the two traffic scenarios in the AM period. However journey times on the R449 South to R148 West route are forecast to increase from 02:49 to 04:13 during the period of highest demand of FAB 24. This level of delay is a result of the forecast increase in queue lengths on the R449 nearside lane approaching the roundabout.

PM peak comparisons, presented in **Table 13.12**, also show similar journey times for routes along the R449 and R148 under both traffic scenarios. Journey time reductions are actually forecast for R148 West to East trips due to increased stacking within the Intel site reducing delay for through trips on the R148.

Route	PM Peak Period Journey Times (mins:secs)		
	Op. Baseline	FAB 24	Difference
R449 South to R148 East	02:54	02:56	**+00:02**
R449 South to R148 West	03:35	03:27	**-00:08**
R148 East to R148 West	02:51	02:51	**-**
R148 West to R148 East	03:06	02:34	**-00:32**
R449 South to West Intel Access	02:58	10:23	**+07:25**
R449 South to Main Intel Access	02:18	03:28	**+01:10**
R449 South to East Intel Access	02:29	07:00	**+04:31**

Table 13.12 Operational Baseline v FAB 24 Average Journey Time Results – PM Peak

All journey times for trips departing from the Intel site are therefore expected to increase with levels of delay of approximately 7 minutes and 25 seconds forecast at the West Intel Junction.

A summary of the forecast operation of the road network adjacent to the Intel site during the period of highest demand of the FAB 24 development is provided below:

AM Peak Period

- Levels of queuing are forecast to increase on the R449 northbound nearside approach to the R148 roundabout (max queue of 53 vehicles but generally much lower);
- Queuing and delay at other locations is considered to be comparable with those forecast in the Operational Baseline; No significant queuing forecast on the northbound approach to the R449 South / Kilmacredock / R449 North / Easton roundabout indicating the traffic operation at the M4 Junction 2a will not be impacted;
- And access for trips to and from Kilmacredock and Easton will not be materially impacted by increased through traffic levels on the R449;
- The road network adjacent to the site can be considered to continue to operate within capacity; and
- Journey time comparisons demonstrate that the road network should continue to operate effectively, with only limited increases in levels of delay.

PM Peak Period

- Appropriately set signals can create stacking within the Intel site and minimise delays to non-Intel traffic;
- Levels of delay are forecast to remain similar and on occasions reduce at junctions adjacent to the Intel site for non-Intel related trips;
- Queuing is expected to increase on the R148 East approach to the R148 / R449 Roundabout; and
- Journey times for outbound trips from the Intel site will increase, with levels of delay of around four and a half minutes expected within the site at the East Intel Junction and seven and a half minutes at the West Intel Junction.

13.8 NON MONTORIZED UNIT (NMU) CONSIDERATION

The FAB 24 development proposals result in the increased demand of travel to and from the Intel site during the construction period (2011 to 2013).

Under this traffic scenario, all private motor vehicle trips will make use of car parking provision within the Intel site. As such Intel will be required to ensure that suitable footways are provided to facilitate safe access within the site.

However the development assessment also assumes that construction staff will achieve an improved mode share by private car of 65% (compared to the existing 83%). Intel would ensure that this level would be achieved via a written instruction to be included within an agreement with all construction contractors. It is considered that the reduction would be achieved through increased car sharing, however it is acknowledged that increased walking, cycling and usage of public transport may also contribute.

Increased use of these travel modes would result in the increased usage of footways and crossing facilities along and across the R148.

It is considered that existing provision will continue to provide safe access to and from the site for pedestrians and cyclists and that this provision is sufficient to accommodate the levels of additional demand that may result from this development.

13.9 PROPOSED MITIGATION MEASURES

The operational testing has demonstrated that no major infrastructure improvements would be necessary; however a number of small scale mitigation measures should be considered and implemented

when appropriate to maintain suitable levels of traffic operation on the local road network during construction of FAB 24.

These measures are as follows:

Mitigation Type	Mitigation Measure	Timeframe	Location
Mobility Management Plan	Monitor queuing levels	Throughout FAB 24 construction period	R148 and R449
	Achieve 65% mode share by private car for construction staff	Throughout FAB 24 construction period	n/a
Signals	Prepare signal infrastructure to facilitate future adjustments	Before FAB 24 construction period	West Intel Access
			Main Intel Access
			East Intel Access
	Adjust to Fixed Signal Plan	Based on queue levels observed in monitoring exercise	West Intel Access
			Main Intel Access
			East Intel Access
	Include Signals on Outbound Left Turn (including associated lining)	Based on queue levels observed in monitoring exercise	West Intel Access
			Main Intel Access

Table 13.13 Proposed Mitigation Measures

The Mobility Management Plan should be updated as part of its regular ongoing review to reflect that Intel should monitor levels of queuing at junctions on the local road network adjacent to the Intel site. This monitoring exercise should be undertaken throughout the construction period of the FAB 24 development to ensure suitable levels of traffic safety and operation are maintained.

Intel should also ensure that the existing signal infrastructure at the three Intel access junctions is suitable to accommodate future signal adjustments that may be required during the highest flow periods of FAB 24 construction (see Table 8-A). This should be done in advance of the forecast peak demand period of construction to make sure that any signal changes during this period can be made quickly to resolve any arising safety or operational issues.

Increased levels of traffic demand during a finite period of the construction of FAB 24 may result in the requirement for the signal settings at the three Intel Access Junctions to be adjusted to fixed signal plans. Based on observed levels of queuing, the adoption of appropriately set fixed signal plans during AM and PM peak periods at these locations could be used to better accommodate additional traffic demands and changing traffic patterns.

The monitoring exercise should include observations on the R148 East approach to the R148 / R449 roundabout to check that queuing is not observed to continuously block back across the LIDL Junction.

Outbound left turn movements at the West and Main Intel Junctions currently operate on a give way basis to R148 mainline traffic. In the PM peak; during the period of highest demand of FAB 24 construction, high levels of traffic are forecast to exit these junctions and turn right at the R148 / R449 roundabout. The current layout assists in mitigating queues and resultant delays for Intel traffic exiting the site, however does not permit any control of traffic exiting the site during PM peak periods. The traffic leaving the main access heading towards the motorway would have priority over left turning vehicles on the R148 East, which could result in queuing on this approach, blocking back across the access to LIDL.

To mitigate this queuing and maintain safe access in and out of LIDL for right turning traffic, the West and Main Intel junctions should include left turn movements within the adopted signal plan. This would allow greater control over exiting traffic from the site and prioritise the operation of the local road network by queuing traffic internally within the Intel site.

The Mobility Management Plan should also be updated to reflect the requirement for contractors to achieve a mode share by private car of at least 65%.

13.10 SUMMARY

A Traffic Impact Assessment has been undertaken to assess the impacts of the proposed FAB 24 development on the road network adjacent to the Intel site.

The development proposals would result in a temporary increase in traffic demand during the construction period. An additional 933 trips are expected during the period of highest demand, over and above future levels without the development taking place. This level is expected to travel to and from the Intel site during the AM and PM time periods. This additional demand is largely accounted for by the required increase in construction staff.

No significant changes in off peak traffic demand to and from the site is forecast during the construction of FAB 24. Traffic operation during the off peak is therefore not expected to be affected by the development.

The increased level of peak period demand will be required for a finite period between 2011 and 2013, and travel demand following construction is expected to reduce to a lower level than currently observed (August 2011).

To mitigate the impacts of the additional trips, various shift patterns would be utilised to spread construction demand across the AM and PM periods. Intel would enforce the use of their Mobility Management Plan to ensure improved mode share targets of 65% by private car are achieved by construction staff.

A microsimulation traffic model was developed and used to assess the operational impacts of the increased travel demand. The model was calibrated and validated against observed traffic conditions.

The model indicates that some increased queuing at junctions adjacent to the Intel site is forecast during the periods of highest demand.

Intel should use their Mobility Management Plan to set out a programme for monitoring queuing on the local road network adjacent to the site, including on the R148 East approach to the R449 roundabout.

In advance of the FAB 24 peak traffic demand period, Intel should also ensure that the existing signal infrastructure is suitable (and if not carry out necessary improvements) to accommodate future signal changes that may be required to maintain safe and effective operation on the local road network.

Based on the queue levels forecast, adjustments to signal settings and changes to signal plans at the three Intel junctions may be required during the highest flow periods of FAB 24 construction. These measures would allow for more effective management of this increase demand and help prioritise the operation of the local road network through increased stacking within the Intel site.

This increased stacking within the Intel site would also help prevent against traffic continuously blocking back across the access to LIDL and maintain continued safe access for right turning vehicles at this location.

Subsequent forecast levels of delay are expected to be reasonable and indicate that the road network would continue to provide an acceptable level of service for Intel and non-Intel related traffic without the need for any infrastructure improvements to the road network.

The development proposals are not expected to result in any material impacts affecting existing pedestrian and cycle provision.

14. ARCHITECTURAL AND CULTURAL HERITAGE

14.1 INTRODUCTION

14.1.1 SCOPE OF WORK

This architectural and cultural heritage chapter was prepared by Miriam Carroll and Annette Quinn of Tobar Archaeological Services. It presents the results of an impact assessment for proposed conversions to an existing building (FAB 24) at the Intel facility, Leixlip, Co. Kildare. The development will consist mainly of the addition of roof stacks and insertion of additional technology into the existing building. The development area consists of a fully developed industrial building and does not include any 'green areas'.

The purpose of this report is to assess the potential impacts of the proposed development on the surrounding architectural and cultural heritage landscape. Archaeological Heritage is addressed in a separate environmental report (also *Tobar Archaeological Services*). This assessment is based on both a desktop review of the available architectural data and a comprehensive programme of field walking of the study area. The study area comprises all the lands within 1km of the FAB 24 building. The report amalgamates desk-based research and the results of field walking to identify areas of architectural and cultural heritage potential, likely to be impacted by the proposed development. An assessment of potential impacts is presented and a number of mitigatory measures are recommended where appropriate.

14.1.2 PROPOSED DEVELOPMENT

The proposed development comprises the conversion of parts of the existing fabrication 24 building at Intel. The proposals includes conversion of a Silian room into a solvent staging room, the construction of a pyrophoric room, reconfiguration of a loading dock, a steel roof structure to support additional stacks and fans, a new bulk gas purifier room, a new room to the rear of FAB 24-2 building and the construction of 2 new lime silo tanks. The FAB 24 building is located on the northern side of the R148 Leixlip to Maynooth. The construction phase of the development will not involve any new ground disturbance. The proposed conversions are located in an existing building.

14.1.3 PROJECT TEAM AND QUALIFICATIONS

Miriam Carroll and Annette Quinn are the directors of Tobar Archaeological Services and both graduated from University College Cork in 1998 with a Masters degree in Methods and Techniques in Irish Archaeology. Both directors are licensed by the Department of the Environment, Heritage and Local Government to carry out excavations and are members of the Institute of Archaeologists of Ireland. Annette Quinn and Miriam Carroll have been working in the field of archaeology since 1994 and have undertaken numerous projects for both the private and public sectors including excavations, site assessments (EIS/EIA) and surveys.

14.1.4 SITE LOCATION AND TOPOGRAPHY

The proposed development area is located approximately 1.8km to the west of Leixlip town on the northern side of the R148. The site itself is an existing building within a large industrial and manufacturing plant (Intel) (**Figure 14.1 – 14.3**). No 'green areas' are proposed to be developed as part of this application.

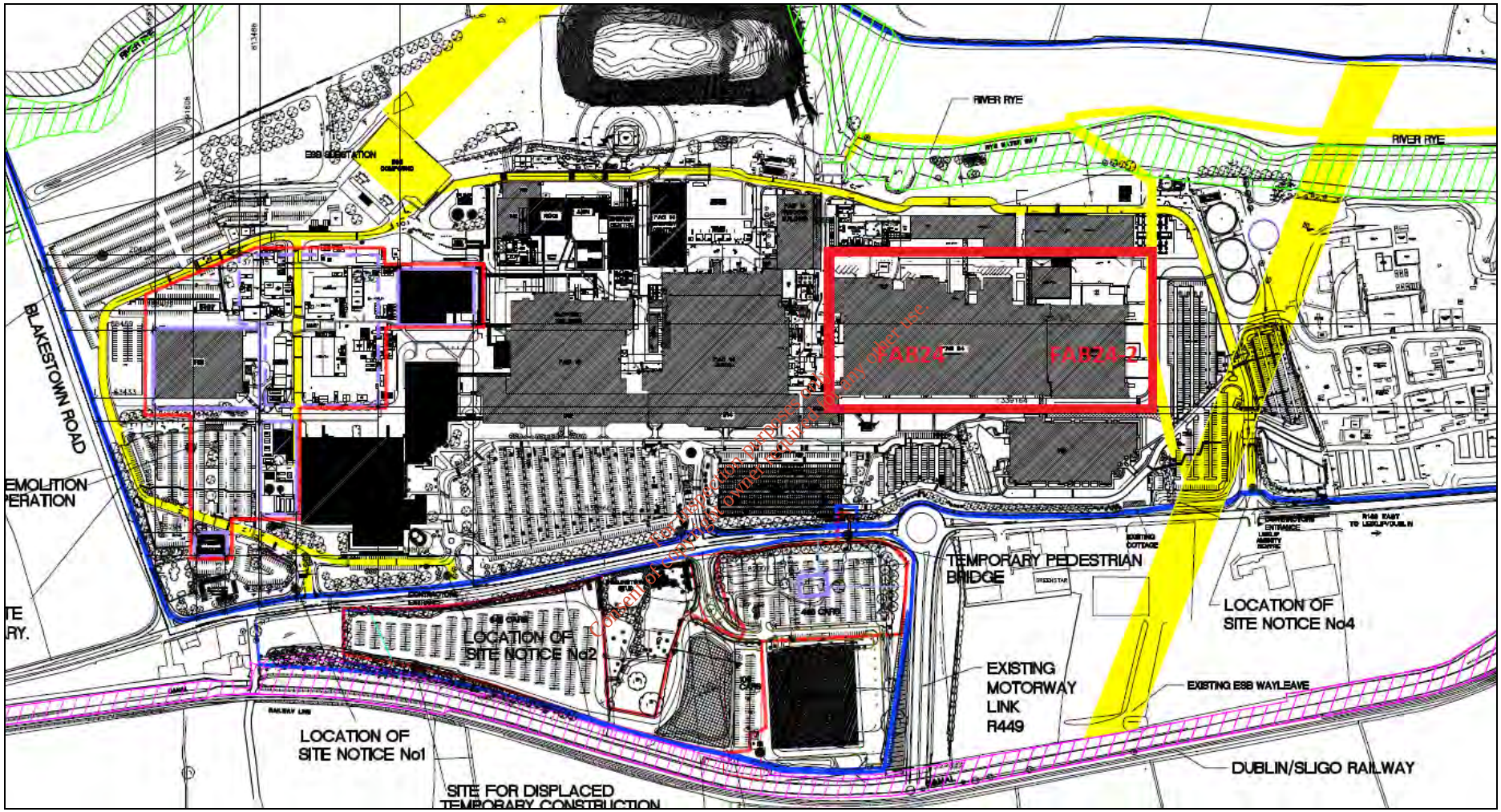


Figure 14.1 Area where Conversions will take place indicated by Red Area (FAB 24).

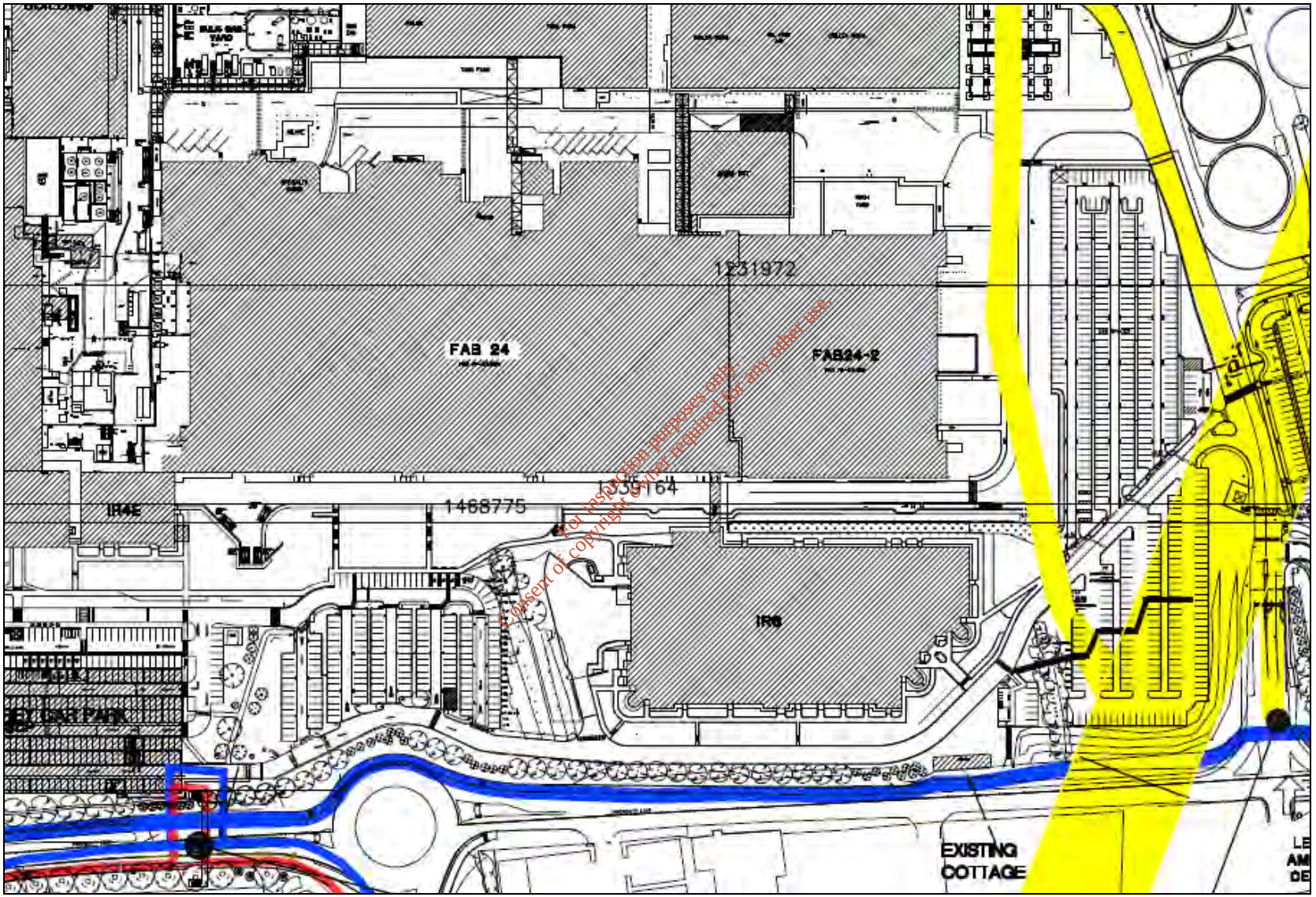


Figure 14.2 FAB 24 Building in relation to Nelson's Cottage indicated by Red Arrow to South

Figure 14.3 Site Location Map

14.2 ASSESSMENT METHODOLOGY

The assessment of the architectural and cultural heritage of the proposed development area included desk-based research as well as field inspection. A desk-based study of the proposed development site was undertaken in order to assess the architectural and cultural heritage potential of the area and to identify features of architectural significance within or near to the proposed development site. Field walking of the study area was undertaken on the 6th September 2011 to determine if previously unrecorded features of significance were located in the area of the proposed development and to assess any potential impacts on known or previously unrecorded structures/items of architectural/cultural heritage significance.

14.1.5 STATUTORY CONTEXT

Current Legislation (Architectural Heritage)

Under the Heritage Act (1995) **architectural heritage** is defined to include '*all structures, buildings, traditional and designed, and groups of buildings including street-scapes and urban vistas, which are of historical, archaeological, artistic, engineering, scientific, social or technical interest, together with their setting, attendant grounds, fixtures, fittings and contents…'*. A heritage building is also defined to include '*any building, or part thereof, which is of significance because of its intrinsic architectural or artistic quality or its setting or because of its association with the commercial, cultural, economic, industrial, military, political, social or religious history of the place where it is situated or of the country or generally*'. Under the same legislation a **heritage building** is defined as '*any building, or part thereof, which is of significance because of its intrinsic architectural or artistic quality or its setting or because of its association with the commercial, cultural, economic, industrial, military, political, social or religious history of the place where it is situated or of the country or generally, and includes the amenities of any such building.*.'. Additional legislative protection for architectural heritage also comes under the Convention for the Protection of the Architectural Heritage of Europe (The Granada Convention) which was ratified by Ireland in 1997.

The legislation to introduce the concept of protected structures was the Local Government (Planning and Development) Act, 1999, replacing the previous system for protecting and preserving structures by listing them in development plans. All the Local Government (Planning and Development) Acts from 1963 to 1999 have now been consolidated in the Planning and Development Act 2000. Part IV of 2000 Act deals with architectural heritage and incorporates the provisions of the Local Government (Planning and Development) Act, 1999. Under the Planning and Development Act 2000 every Development Plan shall include a Record of Protected Structures 'for the purpose of protecting structures, or parts of structures, which form part of the architectural heritage and which are of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest…'.

Additional recent policy documents such as *Government Policy on Architecture 2009 – 2015* reinforces the importance of the protection of the architectural heritage of the country. In this document its states that '*the State is committed to the highest standards in the protection, conservation, and maintenance of the built heritage and landscapes in its care and to promoting the adoption of these standards towards the historic built environment*'.

Kildare County Development Plan

The Kildare County Development Plan (2011-2017) outlines a number of policies and objectives relating to architectural heritage. The aim of the CDP in relation to Heritage and Archaeology is '*To protect, conserve and manage the archaeological and architectural heritage of the county and to encourage sensitive sustainable development so as to ensure its survival and maintenance for future generations*'.

The CDP Strategies are as follows:

- Protect and conserve buildings, structures and sites of special architectural, historic, archaeological, artistic, cultural, scientific, social or technical interest.
- Protect and conserve the archaeological heritage of the county. Secure the preservation in-situ or by record of all sites and features of historical and archaeological interest.
- Protect and conserve areas that have particular environmental qualities that derive from their overall layout, design and character.

- Protect and conserve historic milestones, street furniture, and other significant features of interest wherever feasible.
- Encourage the rehabilitation, renovation and re-use of existing older buildings where appropriate.

In relation to Protected Structures the CDP states that 'a protected structure, unless otherwise stated, includes the interior of the structure, the land lying within the curtilage of the structure and any other structure lying within the curtilage.' The CDP also notes that the protection afforded to a protected structure also extends to 'any features specified as being in the attendant grounds.' Furthermore the CDP states that 'the placing of a structure on the RPS seeks to ensure that the character of the structure is maintained and any changes or alterations to it are carried out in such a way as to retain and enhance this character. Works to a protected structure, that would, materially affect the character of the structure, require planning permission.

The policies of the Kildare CDP relating to Architectural Heritage (Protected Structures) are as follows:

It is the policy of the Council:

PS 1: To conserve and protect buildings, structures and sites contained on the Record of Protected Structures of special architectural, historic, archaeological, artistic, cultural, scientific, social or technical interest.

PS 2: To protect the curtilage of protected structures or proposed protected structures and to refuse planning permission for inappropriate development within the curtilage or attendant grounds of a protected structure which would adversely impact on the special character of the protected structure including cause loss of or damage to the special character of the protected structure and loss of or damage to, any structures of architectural heritage value merit within the curtilage of the protected structure. Any proposed development within the curtilage and/or attendant grounds must demonstrate that it is part of an overall strategy for the future conservation of the entire built heritage complex and contributes positively to that aim.

PS 3: To require that new works will not obscure views of principal elevations of protected structures.

PS 7: To promote best practice and the use of skilled specialist practitioners in the conservation of, and any works to, protected structures. Method statements should make reference to the DoEHLG's *Advice Series* on how best to repair and maintain historic buildings. As outlined in the DoEHLG's Architectural Heritage Protection Guidelines, a method statement is a useful tool to explain the rationale for the phasing of works. The statement could summarise the principal impacts on the character and special interest of the structure or site and describe how it is proposed to minimise these impacts. It may also describe how the works have been designed or specified to have regard to the character of the architectural heritage.

PS 8: To encourage high quality design in relation to planning applications that are made for the construction of extensions or new buildings affecting protected structures or older buildings of architectural merit not included in the RPS.

PS 9: To favourably consider the change of use of any structure included on the Record of Protected Structures provided such a change of use does not adversely impact on its intrinsic character.

PS 10: To actively encourage uses that are compatible with the character of protected structures. In certain cases, the Planning Authority may relax site zoning restrictions / development standards in order to secure the preservation and restoration of the structure.

PS 11: To promote the maintenance and appropriate reuse of buildings of architectural, cultural, historic and aesthetic merit which make a positive contribution to the character, appearance and quality of the streetscape or landscape and the sustainable development of the county. Any necessary works should be carried out in accordance with best conservation practice.

PS 12: To promote the retention of original or early building fabric including timber sash windows, stonework, brickwork, joinery, render and slate. Likewise the Council will encourage the re-instatement of historically correct traditional features.

PS 13: To retain where practicable a protected structure which has been damaged by fire, and to retain those elements of that structure that have survived (either in whole or in part) and that contribute to its special interest.

PS 14: To refuse planning permission for the demolition of any protected structure unless the Council is satisfied that exceptional circumstances exist. The demolition of a protected structure with the retention of its façade will likewise not generally be permitted.

PS 15: To require an architectural heritage assessment report, as described in Appendix B of the DoEHLG *Architectural Heritage Protection, Guidelines for Planning Authorities, 2004*, in all applications involving a protected structure.

PS 16: To protect and retain important elements of the built heritage including historic gardens, stone walls, landscapes and demesnes, and curtilage features.

PS 17: To encourage appropriate change of use and reuse of industrial buildings, provided such a change does not seriously impact on the intrinsic character of the structure and that all works are carried out in accordance with best conservation practice.

Leixlip Local Area Plan 2010

Section 9.2.1 of the Local Area plan (p.20) outlines the following in relation to architectural and vernacular heritage '*Vernacular architecture makes a strong contribution to the character of streetscapes and it is an objective of the Council to protect vernacular architecture in Leixlip for the benefit of future generations. It shall be an objective of the Council to protect the named structures and their settings highlighted in Table 4 above and identified on Maps 2a and 2b, in the assessment of any development proposal*.

Vernacular architecture would include items and structures such as Nelson's cottage which is listed as IP60 protected structure.

The policies in relation to **Built Heritage** are as follows:

BH 1 To promote the retention of original or early building fabric including timber sash windows, stonework, brickwork, joinery, render and slate. Likewise, the Council will encourage the re-instatement of historically correct traditional features.

BH 2 To resist the demolition of vernacular architecture of historical, cultural and aesthetic merit, which makes a positive contribution to the character, appearance and quality of the local streetscape and the sustainable development of Leixlip.

BH 3 To assist owners of structures of particular significance within Leixlip in their maintenance and repair through advice and grant aid under the Building Conservation Grants scheme operated by the DoEHLG.

BH 4 To protect those built heritage items as listed in Table 4 and shown on Maps 2a and 2b of this Local Area Plan.

BH 5 To protect and preserve the views to and from those items listed in Table 4 above and shown on Maps 2a and 2b of this Local Area Plan.

14.1.6 DESKTOP ASSESSMENT

A primary cartographic source and base-line data for the assessment was the consultation of all available historic maps including 1st and 2nd Edition mapping for County Kildare. The main source for information on Protected Structures and Architectural Heritage is the Record of Protected Structures in the relevant

County Development Plans. The National Inventory of Architectural Heritage (NIAH) also lists any structures which are of architectural heritage merit in any given county. The proposed development site was inspected by *Tobar Archaeological Services* in September 2011. A photographic record was made of the development area.

The following sources were consulted for this assessment report:

- First edition Ordnance Survey maps 1838 (www.irishhistoricmaps.ie and Kildare Library)
- Second edition Ordnance Survey maps (www.irishhistoricmaps.ie)
- Third edition Ordnance Survey Map (Record of Monuments and Places for County Kildare – in house)
- Aerial photographs (Smartmaps copyright of Ordnance Survey Ireland (OSI)
- Excavations Bulletins
- Kildare County Development Plan 2011-17
- Leixlip LAP 2010
- National Inventory of Architectural Heritage for County Kildare
- Petty's Map of 1683 – Salt Barony
- Nobel Keenan's Map of 1752
- Alexander Taylor's map of 1783
- Edward Lucas Map of 1655 'Barony of Salt'

Cartographic Sources and Aerial Photography
The 1st (1838) edition and 2nd Edition (1900s) OS maps for the area were consulted as was OSI aerial photography on OSI.ie. A number of other cartographic sources were also consulted in Kildare library in an attempt to trace the historical development of the site.

Kildare County Development Plan 2011-17
The Development Plan was consulted for the schedule of buildings (Record of Protected Structures) and items of cultural, historical or archaeological interest which may be affected by the proposed development. The strategies and policies on Architectural l Heritage were consulted for this report.

Leixlip Local Area Plan 2010
The proposed development site is within the boundary of the Leixlip LAP and is addressed above in section 14.6.3. **Figure 14.4** shows the location of FAB 24 in relation to protected structures listed in their plan.

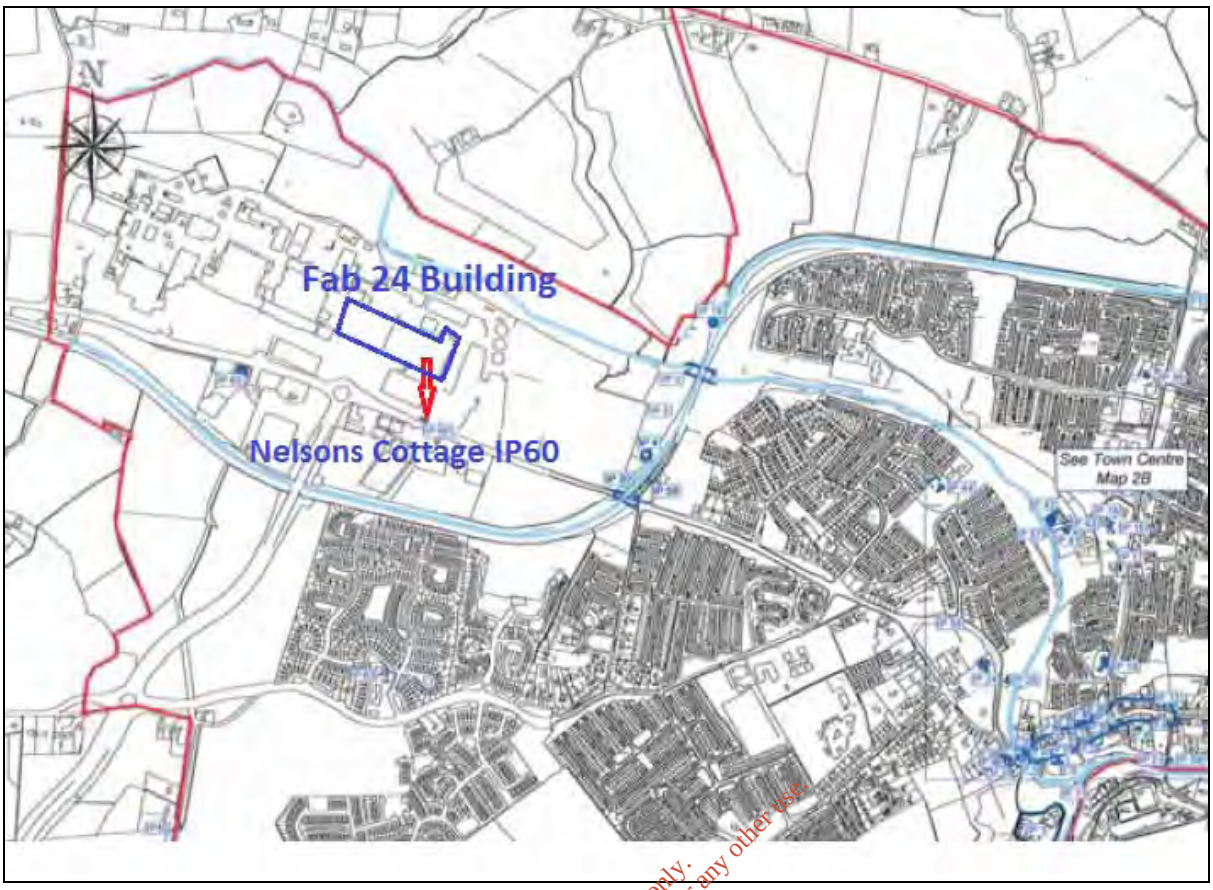


Figure 14.4 Extract from Leixlip LAP 2010
(LAP Boundary in Red Nelsons Cottage by Red Arrow)

National Inventory of Architectural Heritage
This inventory was completed for County Kildare and is available for consultation on www.buildingsofireland.ie. No structures listed in the NIAH are located within the immediate environs of the proposed development site. Deey Bridge is the nearest structure to the proposed development site and is located to the west of the proposed site (NIAH Reg. No. 11900602).

14.3 FIELD INSPECTION

General
The study area was inspected by *Tobar Archaeological Services* over one day in September 2011. The field inspection included all areas within the site boundary and features of architectural heritage merit within the environs which are accessible to the public. An all inclusive site survey allows for the proper examination of the site as a whole and an accurate assessment to be made of the architectural context of the site within a wider landscape.

14.4 CONSULTATIONS

No pre-planning consultations were made for this assessment report.

14.5 EXISTING ENVIRONMENT

14.5.1 ARCHITECTURAL HERITAGE

For the purposes of this report architectural heritage includes all structures listed in the RPS, NIAH and those which are regarded as being of architectural heritage merit. One structure listed in the RPS in the Leixlip Local Area Plan 2010 is located adjacent and to the south of the proposed development site of FAB 24 (Stone Cottage IP60). Deey Bridge at Lock 13 on the Royal Canal is also a protected structure and is located outside the site boundary to the west. A house known as Music Hall and later as Ryebrook

was originally located within the Intel site, west of FAB 24. The house is no longer extant, however, cartographic and documentary sources relating to this structure are detailed below. A descriptive and photographic record of the proposed development area is presented in Appendix 14.1 to this Chapter.

14.5.2 HISTORY OF LEIXLIP

The name Leixlip comes from the old Norse word 'Lax-hlaup' meaning Salmon Leap. The name is derived from the waterfall which was situated above Leixlip on the River Liffey. From the Latin version of the name – Saltus Salmonis, the Baronies of North and South Salt are named (Curran *et al* 2001, 69).

Samuel Lewis has an account of Leixlip in *Lewis' Topographical Dictionary of Ireland* (1837). He describes Leixlip as follows:

> '***LEIXLIP**, a market and post-town, and a parish, in the barony of NORTH SALT, county of KILDARE, and province of LEINSTER, 12 miles (N. N. E.) from Naas, and 8 (W.) from Dublin: containing 1624 inhabitants, of which number, 1159 are in the town. This place was included in the grant originally made to Adam Fitz Hereford, one of the earliest of the English adventurers, who is said to have built the castle, which is situated on an eminence overlooking the river Liffey, and according to tradition was the occasional residence of John, Earl of Morton, while governor of Ireland in the reign of his father, Henry II. It was afterwards granted to the abbey of St. Thomas' court, Dublin; and by an inquisition in 1604 it appears that Thomas Cottrel, the last abbot of that house, was seized of the manor of Leixlip and the right of a flagon of ale out of every brewing in the town.*
>
> *The castle and manor were subsequently purchased by the Rt. Hon. Thomas Conolly, Speaker of the Irish House of Commons, and are now the property of Colonel Conolly, of Castletown. This venerable mansion was the favourite retreat of several of the viceroys, of whom Lord Townsend usually spent the summer here; it is at present the residence of the Hon. George Cavendish, by whom it has been modernised and greatly improved. The other seats are Rye Vale, the residence of Dan. P. Ryan, Esq.; Leixlip House, of John D. Nesbitt, Esq.; and Music Hall, of Captain Hackett, R. N. The town is situated near the confluence of the Rye Water with the river Liffey, over which is an ancient stone bridge of three arches, and on the mail coach road from Dublin to Galway.*
>
> *It consists only of one street; the houses are irregularly built, and with the exception of a few of handsome appearance, have generally an aspect of negligence and decay; the inhabitants are amply supplied with water from springs. The woollen manufacture is still carried on, though at present on a very limited scale, employing only six persons.*
> *On the banks of the Liffey are rolling-mills for the manufacture of bar and sheet iron; and near them is a flour-mill; a mill race 40 feet wide has been constructed in the castle demesne, for the purpose of turning another mill, or for applying water power to some manufactory. On the Rye Water is the Rye Vale distillery, which produces more than 20,000 gallons of whiskey annually. The Royal canal approaches within half a mile of the town, and is carried over the river Liffey by an aqueduct nearly 100 feet high, affording facility of water carriage to Dublin. The market is on Saturday, and fairs are held annually on May 4th and Oct. 9th. There is a constabulary police station in the town.*
>
> *The parish comprises 7974 statute acres, as applotted under the tithe act; a considerable portion of the land is in pasture for fattening stock for the Dublin, Liverpool, and Bristol markets, and the remainder is under tillage. The soil is good, and the system of agriculture slowly but progressively improving; there is neither waste land nor bog, and, from the consequent scarcity of fuel, the peasantry are dependent on such precarious supplies as they can find in the roads and hedges. Limestone is very abundant, and is quarried to a considerable extent, for building, and also for burning into lime for manure. The country around, though deficient in those striking features of romantic grandeur which distinguish the neighbouring county of Wicklow, concentrates much that is pleasing and picturesque in landscape. The surface is finely undulating and richly diversified with wood and water, and the view embraces the town with its ancient bridge, numerous elegant seats with highly cultivated demesnes, ancient and picturesque ruins, distant mountains, and a variety of other interesting features of rural scenery.*

The living is a rectory and vicarage, in the diocese of Dublin, united by act of council, prior to 1662, to the vicarages of Esker and Lucan, the curacies of Confoy and Stacumnie, and the denominations of Aldergh, Westmorestown and St. Catherine's, and in the patronage of the Archbishop. The tithes for the whole union amount to £600; the glebe-house was built by a loan of £562 from the late Board of First Fruits, in 1822; the glebe comprises 28 acres of profitable land. The church, an ancient structure with a massive square tower, has been recently repaired by a grant of £291 from the Ecclesiastical Commissioners.

In the R. C. divisions the parish forms part of the union or district of Maynooth and Leixlip; the chapel is a small edifice, situated on the banks of the Rye Water, and is about to be replaced by a handsome structure of larger dimensions. About 70 children are taught in an infants' school, and there are three private schools, in which are about 170 children. In the parish is a chalybeate spring of great strength and purity, which was in high repute towards the close of the last century; in winter the water is somewhat tepid; it is situated about half a mile from the town, by the side of the canal; the Rt. Hon. Thomas Conolly intended to build a pump-room and an hotel, but dying before they were commenced, the design was abandoned for the more fashionable spa of Lucan, which is nearer to Dublin'.

Leixlip was also popular as a tourist attraction during the nineteenth century. A spa was discovered in 1793 near Louisa Bridge during the construction of the Royal Canal. It was discovered by workmen during the excavation work associated with the Royal Canal (Kelly, A Walking tour of Leixlip, 42). For a time this rivalled the nearby Lucan Spa (Curran 2001, 68). The Royal Canal was built as a rival canal to the Grand Canal and linked Dublin to the River Shannon. One of the directors of the Royal canal company Alfred Cope gave his name to Cope Bridge in Confey (*ibid.*, 42). Likewise Leixlip castle attracted visitors and it was described in the Irish Penny Journal of 1840 as being 'in a grander position than even Warwick itself'. It stood on the confluence of the River Liffey and Rye and was built by the Normans in the late 12th century. It was the home, for many generations of the Whyte family and was bought from them in 1731 by William Connolly.

Griffiths Valuation (1847-1864)

The following table shows the occupants of Nelsons Cottage (IP60) and Music Hall (later named Ryebrook House) in 1850. Nelsons Cottage was occupied by Michael Moran and owned by the Reverend Cuthbert Fetherston. Music Hall or Ryebrook House was occupied by John Hackett Esq. and owned by Jas. T.C. Saunders. **Figure 14.5** shows the house and lands.

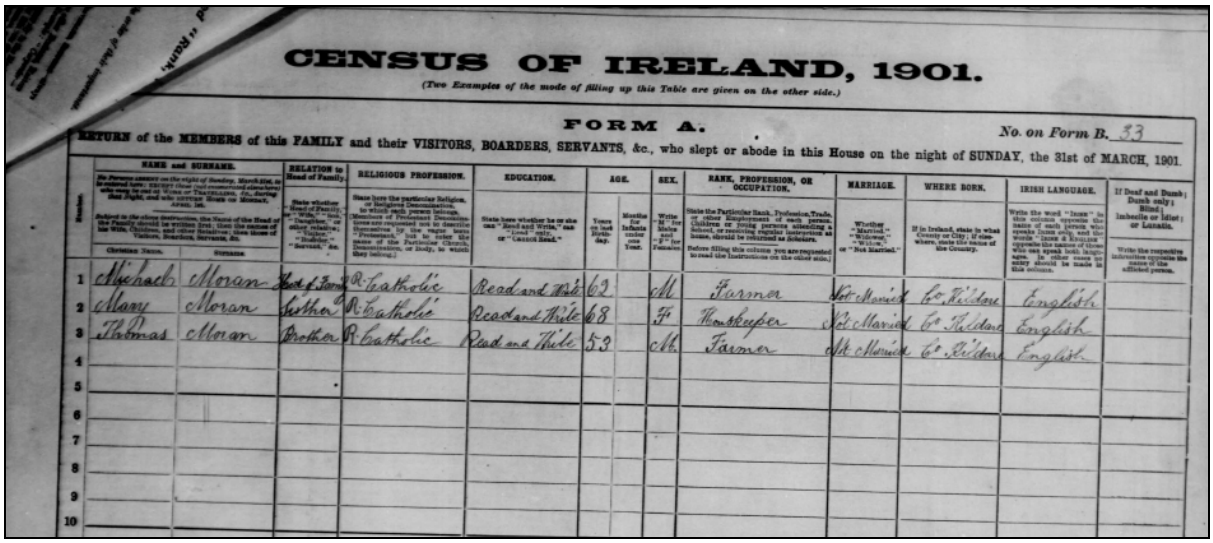
				Total, . .	134	3	
		LEIXLIP. (*Ord. S.* 6 & 11.)					
1		John Hackett, Esq. .	Rev. Jas. T. C. Saunders,	House, offices, and land,	125	3	2
2	*a*	William Levy, . .	Mrs. Margaret Lover,	House, offices, and land,	34	1	3
—	*b*	Mary M'Nally, . .	William Levy, . .	House, . . .		—	
—	*c*	Terence Neill, . .	William Levy, . .	House, . . .		—	
3		Michael Moran, . .	Rev. Cuthbert Fetherston, . . .	House, offices, and land,	51	2	
4		Michael Moran, . .	Thomas Conolly, Esq.	Land, . . .	2	0	1
5		Michael Moran, . .	Alexander Bourke, .	Land (canal banks), .	6	1	
6		M. G. W. Railway & Royal Canal Co.	In fee, . .	Railway 75 lineal perches, and canal and banks, 77 lineal perches, . . .	3	0	
—	*a*	M. G. W. Railway & Royal Canal Co.	In fee, . . .	Station-house, . .		—	
7		Wilson Kenny, .	M. G. W. Railway, & Royal Canal Co.	House, office, and land,	5	2	
8		Francis Kilmartin, .	Rev. Cuthbert Fetherston, . . .	House and land, .	1	1	2
9	ABCAD	Michael Moore, . .	Thomas Conolly, Esq.	Offices and land,	68	3	
—	*Aa*	Edward Douge, . .	Michael Moore, . .	House, . . .		—	

Table 14.1 Griffiths Valuation of 1850

Figure 14.5 Griffiths Valuation Map Extract Stone Cottage (Plot No. 3) and Music Hall (Plot No. 1)

Census 1901

The 1901 census shows that the stone cottage was still occupied by a Michael Moran, Mary Moran and Thomas Moran. The house consisted of 1 roof, six windows in front and had 11 out offices and farm buildings associated with the dwelling.



CENSUS OF IRELAND, 1901.

(Two Examples of the mode of filling up this Table are given on the other side.)

FORM A. No. on Form B. 33

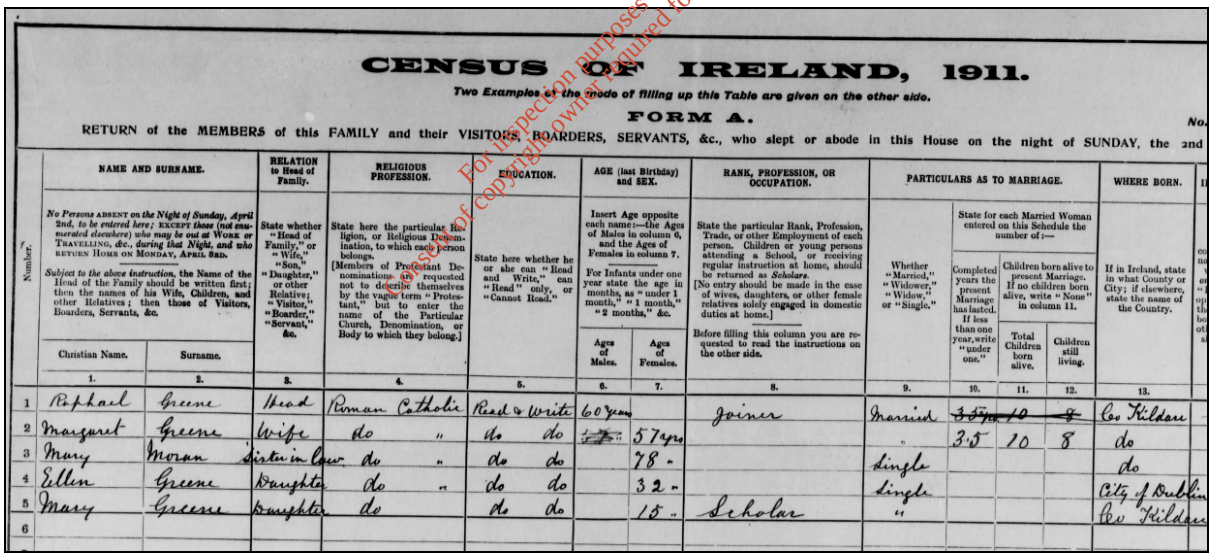
RETURN of the MEMBERS of this FAMILY and their VISITORS, BOARDERS, SERVANTS, &c., who slept or abode in this House on the night of SUNDAY, the 31st of MARCH, 1901.

Number	NAME and SURNAME. Christian Name.	Surname.	RELATION to Head of Family.	RELIGIOUS PROFESSION.	EDUCATION.	AGE. Years on last Birthday.	Months for Infants under one Year.	SEX. Write "M" for Males and "F" for Females.	RANK, PROFESSION, OR OCCUPATION.	MARRIAGE.	WHERE BORN.	IRISH LANGUAGE.	If Deaf and Dumb; Dumb only; Blind; Imbecile or Idiot; or Lunatic.
1	Michael	Moran	Head of Family	R. Catholic	Read and Write	63		M	Farmer	Not Married	Co. Kildare	English	
2	Mary	Moran	Sister	R. Catholic	Read and Write	68		F	Housekeeper	Not Married	Co. Kildare	English	
3	Thomas	Moran	Brother	R. Catholic	Read and Write	53		M	Farmer	Not Married	Co. Kildare	English	
4													
5													
6													
7													
8													
9													
10													

Figure 14.6 Extract from 1901 census for 'Nelson's Cottage

Census 1911

According to the 1911 census 'Nelson's' Cottage was occupied by Mary Moran who appeared on the 1901 census. The house was also occupied by Raphael and Margaret Greene.



CENSUS OF IRELAND, 1911.

Two Examples of the mode of filling up this Table are given on the other side.

FORM A. No.

RETURN of the MEMBERS of this FAMILY and their VISITORS, BOARDERS, SERVANTS, &c., who slept or abode in this House on the night of SUNDAY, the 2nd

Number	NAME AND SURNAME. Christian Name.	Surname.	RELATION to Head of Family.	RELIGIOUS PROFESSION.	EDUCATION.	AGE (last Birthday) and SEX. Ages of Males.	Ages of Females.	RANK, PROFESSION, OR OCCUPATION.	PARTICULARS AS TO MARRIAGE. Whether "Married," "Widower," "Widow," or "Single."	State for each Married Woman entered on this Schedule the number of:— Completed years the present Marriage has lasted. If less than one year, write "under one."	Children born alive to present Marriage. If no children born alive, write "None" in column 11. Total Children born alive.	Children still living.	WHERE BORN. If in Ireland, state in what County or City; if elsewhere, state the name of the Country.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1	Raphael	Greene	Head	Roman Catholic	Read & Write	60 years		Joiner	Married	~~35 yrs~~	~~10~~	~~8~~	Co Kildare
2	Margaret	Greene	Wife	do "	do	~~35~~	57 yrs		"	35	10	8	do
3	Mary	Moran	Sister in Law	do "	do		78 "		Single				do
4	Ellen	Greene	Daughter	do "	do		32 "		Single				City of Dublin
5	Mary	Greene	Daughter	do	do		15 "	Scholar	"				Co Kildare
6													

Figure 14.7 Extract from 1911 census for Morans 'Nelson's Cottage

Cartographic Evidence for Nelsons Cottage and Music Hall (Ryebrook House)

A number of cartographic sources were consulted as part of the desktop assessment for the lands and buildings around the proposed development area. The earliest map which shows the townland name of Leixlip is Petty's Down Survey map of the barony of Salt dating to 1655 (Edward Lucas).

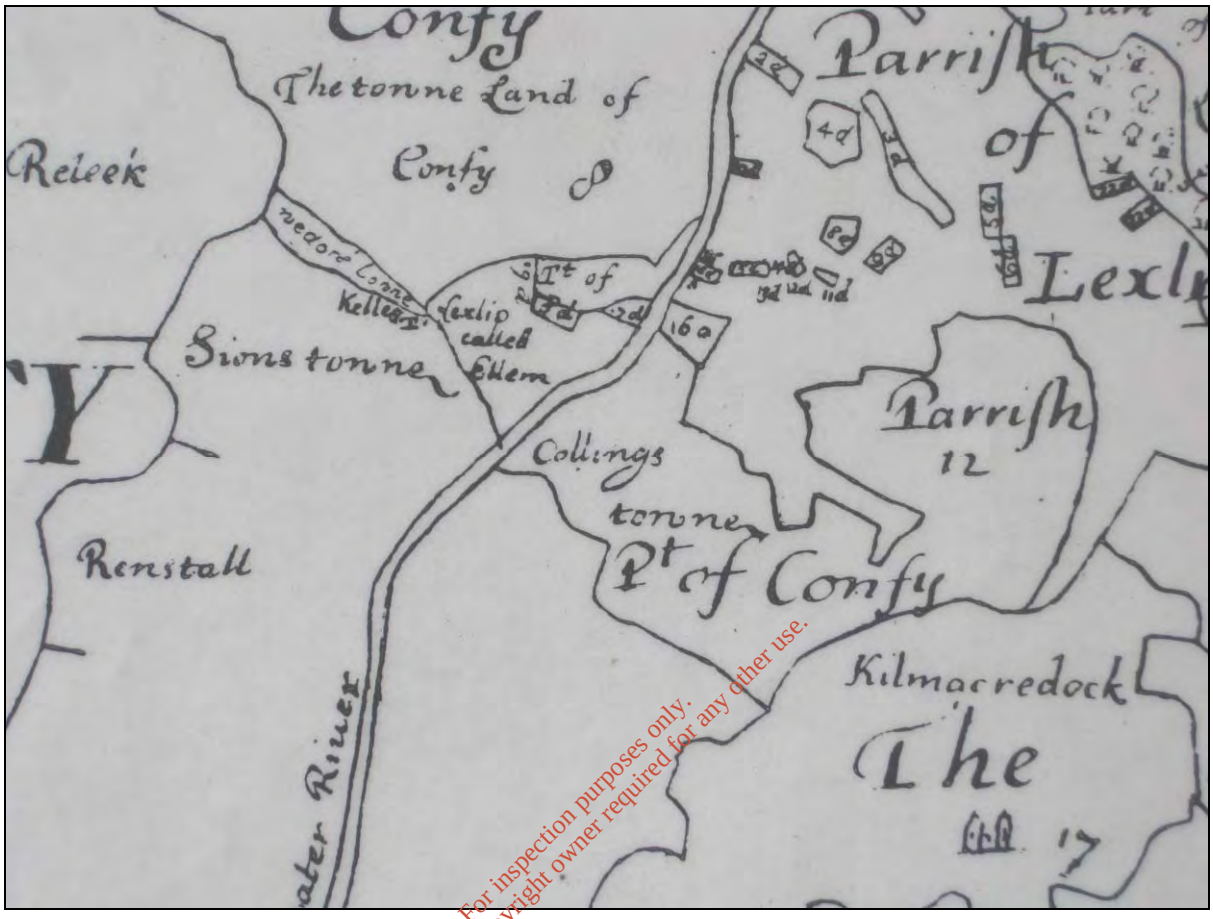


Figure 14.8 Extract from Down Survey Barony Map, 1655 showing Parish of Confey & Leixlip

A later 17th century map of 1683 (Petty) also shows the barony of Salt in which Leixlip is again shown (Fig. 3-5). While these maps are useful in demonstrating the longevity of the townland name and place itself – from at least the mid 1600s – little detail is provided regarding buildings or other features therein.

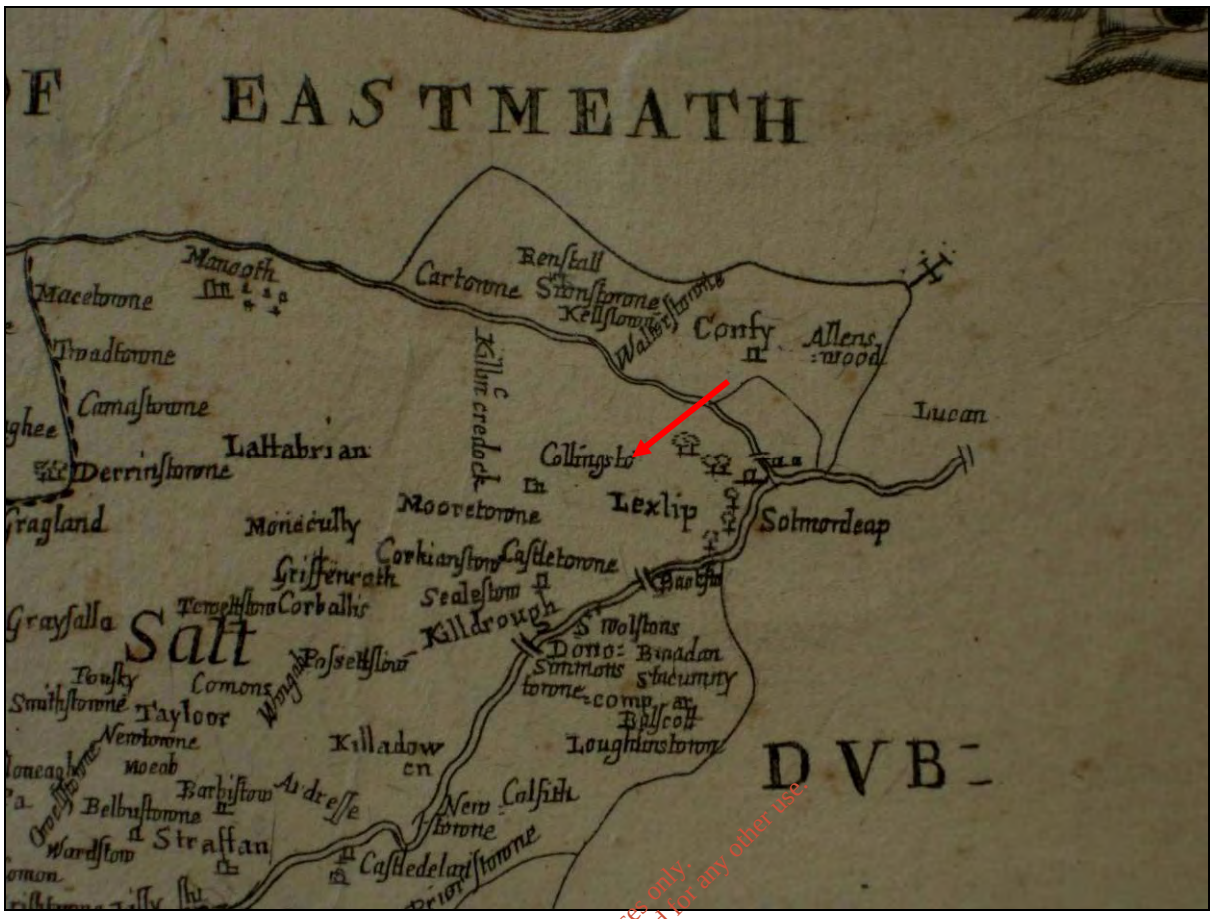


Figure 14.9 Extract from Petty's 1683 Map of Kildare showing Area of Proposed Development

The Nobel & Keenan map of 1752 provides somewhat more of this detail depicting a structure, possibly the house 'Music Hall' (Fig. 3-6). Some thirty-one years later on a Map of Kildare by Alex Taylor (1783) Music Hall is again depicted showing a large structure (Fig. 3-7). The next definitive depiction of Music Hall and Nelson's Cottage is on the first edition Ordnance Survey map (1838) which clearly shows the houses, gardens and outbuildings north of the Leixlip-Maynooth road (Fig. 3-8). The later second edition map (1900s) also depicts the structures (Fig. 3-9).

Figure 14.10 Extract from Nobel & Keenan Map of 1752, with possible Location of 'Music Hall'

Figure 14.11 Extract from Alex Taylor's Map of 1783 showing 'Musichall' now occupied by FAB 24

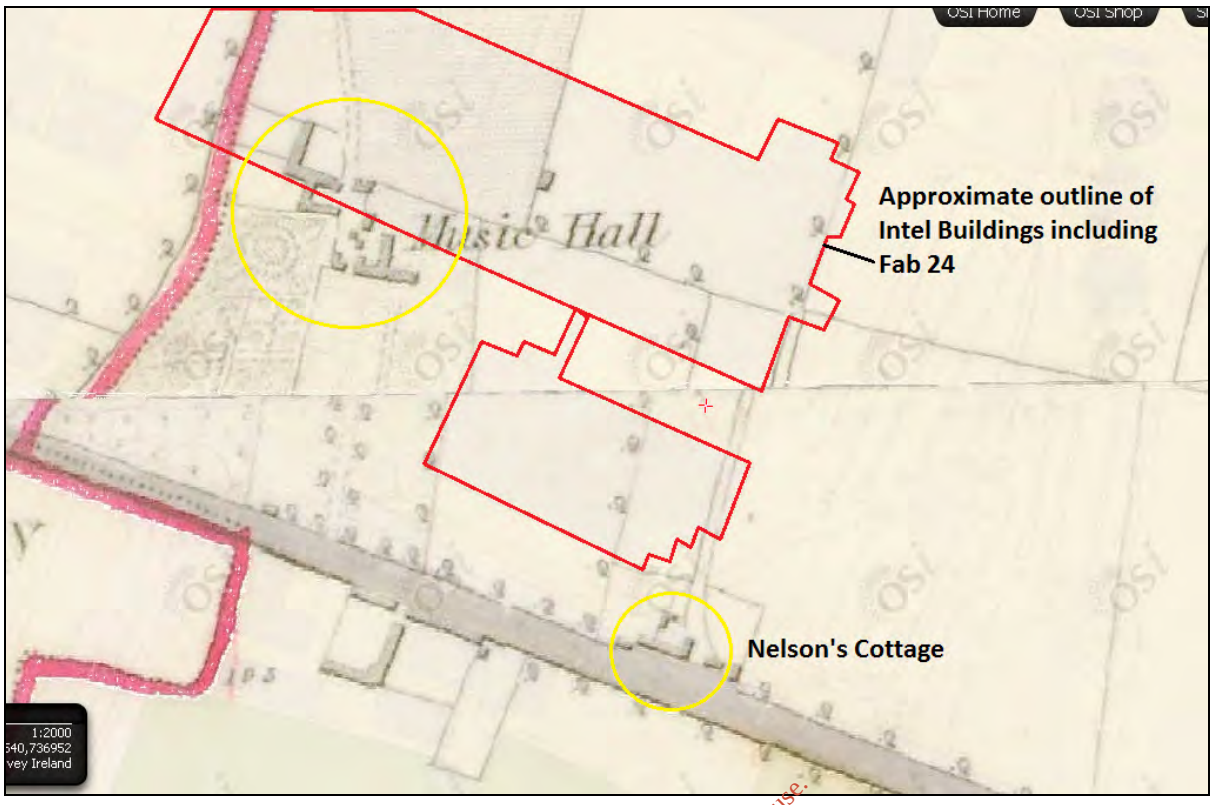


Figure 14.12 1st Edition OS Map 1838 with modern overlay showing Nelson's Cottage and Music Hall in relation to FAB 24 to north (Sheets 6 and 11)

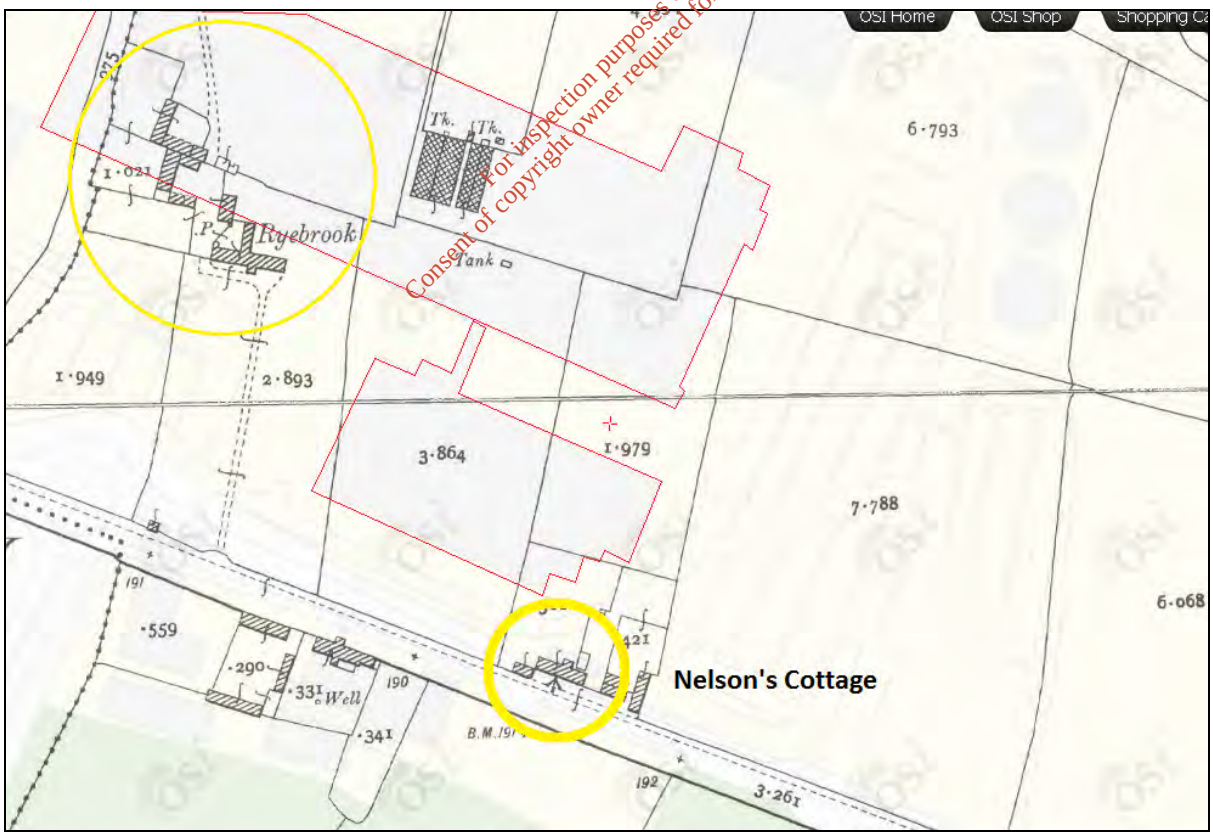


Figure 14.13 2nd Edition OS map (1900s) with modern Overlay showing Nelsons Cottage, with additional outbuildings. Ryebrook House, formerly Music Hall now demolished in area of FAB 24

14.5.3 ARCHITECTURAL HERITAGE SITES LOCATED WITHIN STUDY AREA

Music Hall or Ryebrook House (see above)
This structure was located on or near to the site of the FAB 24 building and is shown on the 1st Edition map of 1837 as Music Hall. It is named Ryebrook on the subsequent 2nd edition OS map. No surface trace of this structure now exists.

On the 1838 Register of Voters List which was published on the 1st February 1837 it includes an entry for a 'John Hackett' of Musichall, Leixlip (Colgan's Chronology of Count Kildare from 1836 to 1849). Lewis [Vol II, p256-7] also notes that that Daniel P Ryan lived at *Rye Vale House*, John D Nesbitt Esq. at *Leixlip House* and Captain Hackett, RN, at *Music Hall*.

There is also a reference in 1839 to an Ellen Catherine Saunders, daughter of **James Glascock**, of the Music Hall, died on 21/9/1839; it is likely that she had a daughter, also Ellen, Saunders, of Fortgranite, Co Wicklow [Deed, ref. 1840-4-15]. Her husband, Morley Saunders, Doctor of Laws, of Saunders Grove, nr. Baltinglass, had died with will, 4/4/1737[?] [*Wills Summaries: Prerogative Court, 1737*, T.12753, NA].

In *Burke's Landed Gentry*, (1847, 1190-1191), he describes the pedigree of the Saunders' family in detail. There were two Irish branches, those at Saunders Grove, Co. Wicklow, headed by Robert Francis Saunders, and the other of Largay, Co. Cavan, whose head was Richard Saunders (in 1847). The family's roots derive from the Lords of Innsbruck, in Germany. The Irish family derived from Robert Saunders who came to Ireland with Cromwell, holding a regiment under him. Robert had three sons, Richard (of Saunders Court, Co Wexford); Anderson, who established the Cavan branch of the family; and Robert, his namesake. This Robert was grandfather of Morley Saunders, Prime Sergeant to Queen Anne. The latter's eldest son, also Morley Saunders, was established at Saunders Grove, Co Wicklow. He married Ellen Katherine Glascock, daughter and heiress of James Glascock, of the Music Hall, Leixlip [She died on 20/9/1839, according to the memorial of deed, ref no 1840-4-15]. They in turn had six children. By 1847, all but their sons, Robert Francis Saunders (their heir to Saunders' Grove) and Rev James Thomas Conolly Saunders had died. The latter married Augusta Sophia, daughter of John Lloyd Williams, Esq., of Alderbrook Hall in Camarthenshire; they had children. Morley Saunders of Saunders Grove died in 1825 and was succeeded by his son, Robert Francis Saunders.

In 1855 the Rev JTC Saunders and wife, of Cheltenham, created a lease dated 30/7/1855 between themselves and Captain John Hackett of 147 Lwr. Gloucester St, Dublin, whereby they transferred the lands of *Ryebrook*, alias *Music Hall* and Island Farm, and about 6 acres of Knockmulroony which were formerly leased by Jas. Glascock, Dublin City to Pierce Hackett, Dublin City, Esq., on 5/3/1800.The lease was witnessed by Thomas Conolly, Gent, of 16 Cabragh Parade, Dublin.

According to John Colgan, sometime around the early 1920s an order of French monks lived at *Ryebrook* [aka *Music Hall*] and a Dr Skipper lived at *Blakestown House*, where Dennis Foley later lived. [John Swan, in conversation with John Colgan, 11/8/2003].

Nelson' Cottage (Stone cottage IP60 Maynooth Road)
'Nelsons' cottage received its name locally and is called after the last occupier of the house. The house was vacated in the last 10-15 years (approximately) and the structure has been well maintained by Intel since then. This structure is listed in the Leixlip LAP 2010 as an item of architectural merit and is therefore protected. The house is located on the northern side of the Leixlip-Maynooth road at one of the entrances to the Intel facility. The house appears on both the 1st Edition and 2nd Edition OS map of 1837 and 1900s respectively (Figs. 3-8 and 3-9 above).The house is now derelict and in a poor state of preservation although structurally sound. Many original features are gone and sash windows have been replaced by PVC windows.

There are no proposals to either demolish or alter this structure as part of this application.

Deey Bridge
Deey Bridge is a Protected Structure (IP61) and is listed in the Leixlip LAP 2010. The bridge was constructed over the Royal canal at Lock 13 in 1795. It is located to the west of the proposed development site and is outside the development site boundary (Fig. 3-10). It is listed in the NIAH for County Kildare and is described as follows:

Description
Single-arch rubble stone road bridge over canal, dated 1793, with ashlar voussoirs and cut-stone date stone/plaque. Irregular coursed squared rubble stone walls. Cut-stone date stone/plaque. Cut-stone coping to parapet walls. Single shallow segmental arch. Ashlar voussoirs. Squared rubble stone soffits with traces of render over. Sited spanning Royal Canal. Grass banks to canal. Canal lock, c.1795, to west with cut-stone retaining walls having timber lock gates over with integrated pedestrian bridge and possibly retaining early mechanisms.

Appraisal
Deey Bridge is a fine rubble stone bridge that forms and imposing feature on the Royal Canal and is one of a number of bridges on the section of that canal that passes through County Kildare. As such it is of considerable social and historic significance, representing the canal network development in Ireland in the late eighteenth century that encouraged the commercialisation and/or industrialisation of the country. The construction of the bridge in squared rubble stone attests to the high quality of stone masonry traditionally practised in the development of the canal, and retains fine, crisp joints. The construction of the arch that has retained its original shape is of technical or engineering merit. Also of technical interest is the attendant lock to west, which possibly retains early mechanisms.

The survey rates the bridge as being of Regional significance.

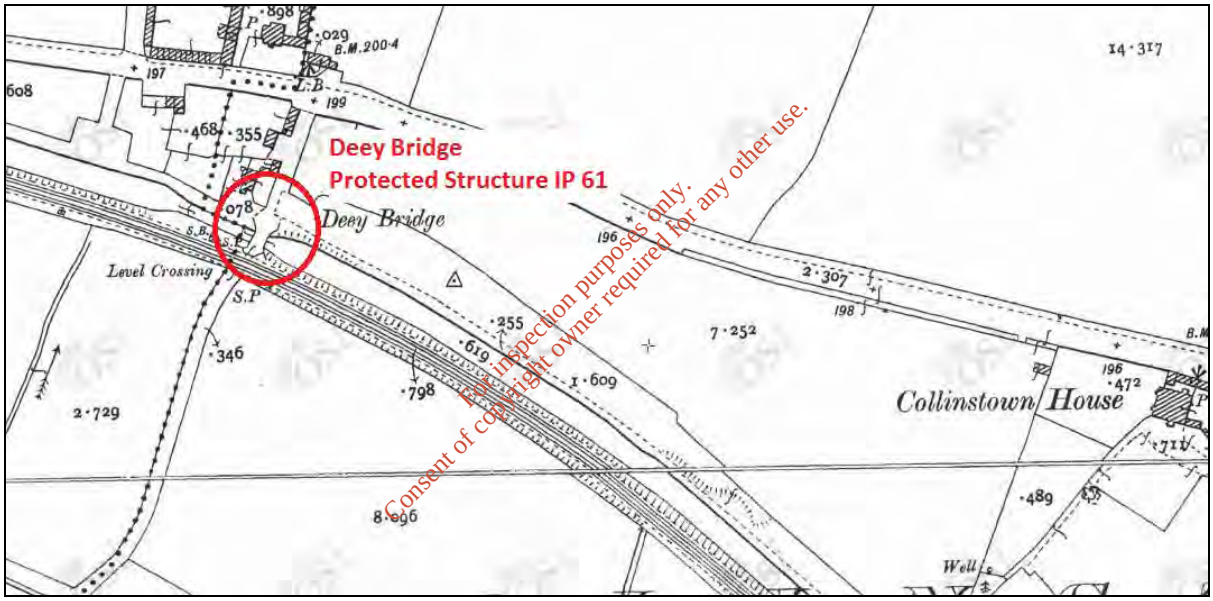


Figure 14.14 Deey Bridge Protected Structure to West of Proposed Development Site

14.6 POTENTIAL IMPACTS

Architectural heritage is a non-renewable resource. The overall objective of this assessment of impacts of the proposed development is to ensure that where a potential impact has been identified, that it can be mitigated against to ensure that the architectural heritage will be available for future generations. The potential impacts on the architectural heritage, both protected structures and newly detected sites, are assessed here.

Potential Direct and Indirect Impacts on the Architectural Heritage
One protected structure lies within the environs of the proposed development area, i.e. Nelson's Cottage. There are no proposals to alter the cottage in any way as part of this application.

The area surrounding the cottage is now heavily industrialised and views of the cottage can be enjoyed from the main Maynooth-Leixlip road. Consequently, the original environment and setting of the house has been much altered, particularly in recent decades. The current proposals are to alter and convert an existing fabrication building (FAB 24). No impacts on the stone cottage are anticipated therefore.

14.7 MITIGATION

No mitigation is necessary as part of this application as no potential impacts have been identified as part of the development proposals.

14.8 SUMMARY

This report was carried out as an Architectural and Cultural Heritage Impact Assessment to be submitted as part of the planning application associated with the conversion of FAB 24 building for Intel Ireland Ltd, Leixlip, Co. Kildare. The assessment included desktop research and a programme of field walking to identify areas of architectural and cultural heritage potential on or close to the proposed development site. One protected structure (Nelson's Cottage IP60) is located on the main road R148 and to the south of the area of the proposed development. No impacts on the structure are anticipated therefore.

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15. ARCHAEOLOGY

15.1 INTRODUCTION

15.1.1 SCOPE OF WORK

This archaeology chapter was prepared by Annette Quinn of Tobar Archaeological Services. It presents the results of an impact assessment for the proposed conversion of the existing FAB 24 building within the Intel plant, Leixlip, Co. Kildare. The nature of the conversions are such that no ground disturbance of green areas will take place and the majority of the proposals are for 'roof stacks'. The development location is shown on **Figure 15.1.**

The purpose of this report is to assess the potential impacts of the proposed development on the surrounding archaeological landscape. Architectural and Cultural Heritage is addressed in a separate environmental report. The assessment is based on both a desktop review of the available archaeological data and a site inspection. The report amalgamates desk-based research and the results of field walking to identify areas of archaeological potential, likely to be impacted by the proposed development. An assessment of potential impacts is presented and a number of mitigatory measures are recommended where appropriate. The visual impact of the proposed development on newly discovered monuments/sites of significance as well as known recorded monuments will also be assessed.

15.1.2 PROPOSED DEVELOPMENT

The proposed development comprises the conversion of parts of the existing FAB 24 building at Intel. The proposals includes conversion of a Silian room into a solvent staging room, the construction of a pyrophoric room, reconfiguration of a loading dock, a steel roof structure to support additional stacks and fans, a new bulk gas purifier room, a new room to the rear of FAB 24-2 building and the construction of 2 new lime silo tanks. The FAB 24 building is located on the northern side of the R148 Leixlip to Maynooth. The construction phase of the development will involve limited ground disturbance in an area already significantly reduced. The proposed conversions are located in an existing building.

15.1.3 PROJECT TEAM AND QUALIFICATIONS

Miriam Carroll and Annette Quinn are the directors of Tobar Archaeological Services and both graduated from University College Cork in 1998 with a Masters degree in Methods and Techniques in Irish Archaeology. Both directors are licensed by the Department of the Environment, Heritage and Local Government to carry out excavations and are members of the Institute of Archaeologists of Ireland. Annette Quinn and Miriam Carroll have been working in the field of archaeology since 1994 and have undertaken numerous projects for both the private and public sectors including excavations, site assessments (EIS/EIA) and surveys.

15.1.4 SITE LOCATION AND TOPOGRAPHY

The proposed development area is located approximately 1.8km to the west of Leixlip town on the northern side of the R148. The site itself is an existing building within a large industrial and manufacturing plant (Intel) (**Figure 15.2**). No 'green areas' are proposed to be developed as part of this application.

Figure 15.1 Site Location

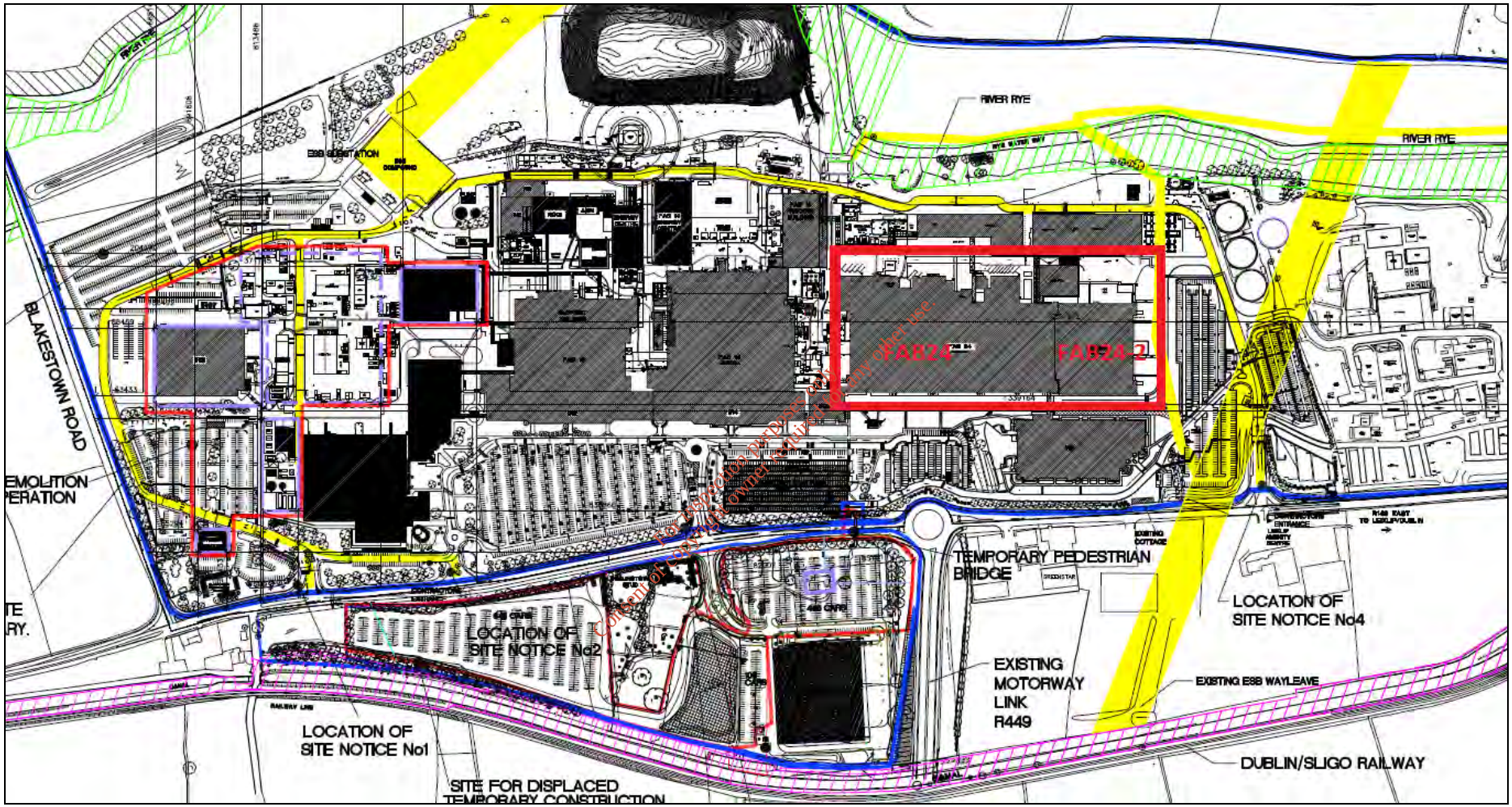

Figure 15.2 Location of FAB 24 building within Intel plant (provided by Jacobs Engineering)

15.2 ASSESSMENT METHODOLOGY

The assessment of the archaeology of the proposed development area included desk-based research as well as field inspection. A desk-based study of the proposed development site was undertaken in order to assess the archaeological potential of the area and to identify features of archaeological significance, if any, within or near to the proposed development site. Inspection of the study area was undertaken on the 6th September 2011 to determine if previously unrecorded archaeological features were located in the area of the proposed development and to assess any potential impacts on known or previously unrecorded sites or monuments.

15.2.1 STATUTORY CONTEXT

Current Legislation (Archaeological)
Archaeological monuments are safeguarded through national and international policy, which is designed to secure the protection of the cultural heritage resource. This is undertaken in accordance with the provisions of the European Convention on the Protection of the Archaeological Heritage (Valletta Convention). This was ratified by Ireland in 1997.

Both the National Monuments Acts 1930 to 2004 and relevant provisions of the Cultural Institutions Act 1997 are the primary means of ensuring protection of archaeological monuments, the latter of which includes all man-made structures of whatever form or date. There are a number of provisions under the National Monuments Acts which ensure protection of the archaeological resource. These include the Register of Historic Monuments (1997 Act) which means that any interference to a monument is illegal under that Act. All registered monuments are included on the Record of Monuments and Places (RMP).

The Record of Monuments and Places (RMP) was established under Section 12 (1) of the National Monuments (Amendment) Act 1994 and consists of a list of known archaeological monuments and accompanying maps. The Record of Monuments and Places affords some protection to the monuments entered therein. Section 12 (3) of the 1994 Amendment Act states that any person proposing to carry out work at or in relation to a recorded monument must give notice in writing to the Minister (Environment, Heritage and Local Government) and shall not commence the work for a period of two months after having given the notice. All proposed works, therefore, within or around any archaeological monument are subject to statutory protection and legislation (National Monuments Acts 1930-2004).

Kildare County Development Plan 2011-2017
The Development Plan outlines a number of policies and objectives relating to archaeology. The aim of the CDP in relation to Heritage and Archaeology is '*To protect, conserve and manage the archaeological and architectural heritage of the county and to encourage sensitive sustainable development so as to ensure its survival and maintenance for future generations*'.

The CDP strategies are as follows:

- Protect and conserve buildings, structures and sites of special architectural, historic, archaeological, artistic, cultural, scientific, social or technical interest.
- Protect and conserve the archaeological heritage of the county. Secure the preservation in-situ or by record of all sites and features of historical and archaeological interest.
- Protect and conserve areas that have particular environmental qualities that derive from their overall layout, design and character.
- Protect and conserve historic milestones, street furniture, and other significant features of interest wherever feasible.
- Encourage the rehabilitation, renovation and re-use of existing older buildings where appropriate.

The policies in relation to Archaeology are as follows:

It is the policy of the Council:

AH 1: To have regard to the Record of Monuments and Places (RMP) and the Urban Archaeological Survey when assessing planning applications for development. No development

shall be permitted in the vicinity of a recorded feature where it detracts from the setting of the feature or which is injurious to its cultural or educational value.

AH 2: To seek to protect and preserve archaeological sites which have been identified subsequent to the publication of the Record of Monuments and Places (RMP).

AH 3: To ensure that development in the vicinity of a site of archaeological interest is not detrimental to the character of the archaeological site or its setting by reason of its location, scale, bulk or detailing and to ensure that such proposed developments are subject to an archaeological assessment. Such an assessment will seek to ensure that the development can be designed in such a way as to avoid or minimise any potential effects on the archaeological heritage.

AH 4: To protect historic burial grounds within the county and encourage their maintenance in accordance with conservation principles in co-operation with the Historic Monuments Advisory Committee and National Monuments Section of the Department of the Environment, Heritage and Local Government (DoEHLG).

AH 5: To ensure that disturbance, removal and alteration of the line of town defences are suitably safeguarded within the historic towns and settlements of County Kildare.

AH 6: To retain where possible the existing street layout, historic building lines and traditional plot widths where these derive from medieval or earlier origins.

AH 7: To promote and support in partnership with National Monuments Section of the Department of the Environment, Heritage and Local Government (DoEHLG), the concept of Archaeological Landscapes where areas contain several Recorded Monuments.

AH 8: To encourage, where practicable, the provision of public access to sites identified in the Record of Monuments and Places under the direct ownership, guardianship or control of the Council and/or the State.

AH 9: To encourage the provision of signage to publicly accessible recorded monuments.

15.2.2 DESKTOP ASSESSMENT

A primary cartographic source and base-line data for the assessment was the consultation of the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP) for County Kildare. All known recorded archaeological monuments are indicated on 6 inch Ordnance Survey (OS) maps and are listed in this record. The 1st (1838) edition OS map for the area as well as aerial photographs were also consulted. The proposed development site was inspected by *Tobar Archaeological Services* in September 2011. A photographic record was made of the development area.

The following sources were consulted for this assessment report:

- The Sites and Monuments Record (SMR)
- The Record of Monuments and Places (RMP)
- The Topographical Files of the National Museum of Ireland
- First edition (1838) Ordnance Survey maps (Kildare County library)
- Second edition Ordnance Survey maps (Smartmaps.ie)
- Third edition Ordnance Survey Map (Record of Monuments and Places for County Kildare – in house)
- Aerial photographs (Smartmaps copyright of Ordnance Survey Ireland (OSI)
- Excavations Bulletins
- Kildare County Development Plan 2011-17
- Leixlip LAP.

Record of Monuments and Places
A primary cartographic source and base-line data for the assessment was the consultation of the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP) for County Kildare. All known recorded archaeological monuments are indicated on 6 inch Ordnance Survey (OS) maps and are listed in this record. The SMR/RMP is not a complete record of all monuments as newly discovered sites may not appear in the list or accompanying maps. In conjunction with the consultation of the SMR and RMP the electronic database of recorded monuments which may be accessed at www.archaeology.ie was also consulted.

Cartographic sources and aerial photography
The 1st (1838) edition and 2nd Edition (1900s) OS maps for the area were consulted as was OSI aerial photography on OSI.ie.

Topographical Files - National Museum of Ireland
Details relating to finds of archaeological material and monuments in numerous townlands in the country are contained in the topographical files held in the National Museum of Ireland. In order to establish if any new or previously unrecorded finds had been recovered from the study area these files were consulted for every townland within and adjacent to the latter.

Kildare County Development Plan 2011-17
The Development Plan was consulted for the schedule of buildings (Record of Protected Structures) and items of cultural, historical or archaeological interest which may be affected by the proposed development. The strategies and policies on Archaeological Heritage were consulted for this report.

Excavations Bulletins
Excavations' Bulletin is an annual account of all excavations carried out under license. The database is available on line at www.excavations.ie and includes excavations from 1985 to 2008. This database was consulted as part of the desktop research for this assessment to establish if any archaeological excavations had been carried out within or near to the proposed development area. One excavation was undertaken within the vicinity of the FAB 24 building. A test excavation was undertaken in advance of the construction of FAB 10 and FAB 14 buildings and nothing of archaeological significance was uncovered (See extract from excavations bulletins below).

Kildare **1994:134** **Collinstown/Blakestown** No archaeological significance **N980370** **94E195** This site was tested in advance of redevelopment. No features of archaeological importance were identified. **Maurice F. Hurley, Lower House, Mallowgaton, Bandon, Co. Cork.**

Table 15.1 Excavation Database Bulletin

15.3 FIELD INSPECTION

General
The study area was inspected by *Tobar Archaeological Services* over one day in September 2011. Field work was carried out by two qualified licensed archaeologists. The field inspection included all areas within the site boundary and sites within the environs which are accessible to the public. An all inclusive site survey allows for the proper examination of the site as a whole and an accurate assessment to be made of the archaeological context of the development area within a wider landscape.

15.4 CONSULTATIONS

No pre-planning consultations were made for this assessment report.

15.5 EXISTING ENVIRONMENT

15.5.1 ARCHAEOLOGICAL HERITAGE

For the purposes of this report archaeological heritage includes all recorded archaeological monuments listed in the RMP/SMR maps. No recorded archaeological monuments are located on or within the area of the proposed conversions associated with the FAB 24 building. Five (5) monuments are located within 1km of the site. No **new** archaeological monuments were encountered during field work. The Recorded Monuments are listed in **Table 15.2** below.

Recorded Archaeological Monuments and other Sites of relevance within the Study Area
The study area consists of the areas within 1km of the proposed development site (**Figure 15.3**). The Record of Monuments and Places (RMP) and the Sites and Monuments Record (SMR) maps were used to compile a list of known sites which occur within the study area.

RMP	Irish Grid	TOWNLAND	Site Type	Location
KD011-053	298493, 36524	EASTON	Fulacht fia	R449 adjacent to site boundary
KD011-054	298664, 36784	COLLINSTOWN (Leixlip ED)	Habitation site	R449 adjacent to site boundary
KD011-055	298631, 36739	COLLINSTOWN (Leixlip ED)	Excavation - miscellaneous	R449 adjacent to site boundary
KD011-056	298415, 36781	COLLINSTOWN (Leixlip ED)	Kiln	Collinstown Lands to south of R148
KD011-007	299458, 36624	LEIXLIP	Holy Well	Site of Spa Well adjacent to Royal Canal.

Table 15.2 Recorded Monuments located within 1 km of the Proposed Site Boundary

Figure 15.3 National Monuments Service Portal with Recorded Monuments in 1km Study Area

Four monument types are represented and include the following; Fulacht Fia (1), Habitation site (1), Kiln (1), a miscellaneous site and a Holy Well (1).

The Prehistoric Period

One of the four monuments in the vicinity of the proposed site is prehistoric in date and may be attributed to the Bronze Age Period.

Fulacht Fiadh (KD011-053, ***Table 15-2****)*

This monument is located outside the site boundary to the south of the Royal canal and to the west of the northern link of the Celbridge Interchange (R449). It is located in the townland of Easton and was discovered during topsoil removal as part of the Celbridge Interchange Scheme. It was fully archaeologically excavated and therefore has no surface expression. *Fulachta fia* are one of the most numerous monuments in the country with thousands in Munster alone. They usually consist of crescent-shaped mounds of burnt soil and stones and represent ancient cooking places. Excavated examples show evidence for a trough which when water-filled is thought to have been used for cooking. The water was boiled by heating stones over a hearth and placing them in the water and in turn cooking the meat. The heated fire-cracked stones were then discarded around the trough, giving the monuments their characteristic horse-shoe shape. These monuments are frequently sited adjacent to or near a water source such as a stream or river or alternatively in low-lying marshy ground. *Fulachta fia* generally date to the Bronze Age (2400-500 BC).

Kildare
2001:640
Easton
Fulacht fiadh
01E0771
This site was discovered during the removal of topsoil as part of the monitoring for the Celbridge Interchange Scheme. Prior to excavation the site consisted of a flat spread of heat-fractured stones measuring 14m by 4.5m. This spread was cut in two by a linear feature running north-east/south-west; this later proved to be a post-medieval boundary ditch. A modern water pipe was also found to be cutting across the site on its northern edge.
The spread measured between 0.05m and 0.1m in thickness and sealed numerous features. Four rectangular troughs were uncovered, two pits, five post-holes and 21 stake-holes. Most of the latter were located on the southern edge of the site.
Gary Conboy, Dooyork, Co. Mayo.

Table 15.3 Excavation Summary for Recorded Monument KD011-053

The Medieval Period

A 'Habitation Site' (KD011-054) and Miscellaneous Excavation site (KD011-055) possibly dating to the medieval period was also uncovered during topsoil stripping associated with the northern Celbridge Interchange Scheme (**Table 15.4**). It is located on the south-eastern side of the roundabout between the R148 and R448, to the south of the proposed development site. It was archaeologically excavated in 2001 and so therefore has no surface expression (see excavation details below).

Kildare
2001:625
Site 16/17, Collinstown
Habitation site, ditch, roasting pit
2986648.770 236784.720
01E0893
This site was found in Collinstown townland during the monitoring of topsoil-stripping of the Northern Link on the Celbridge Interchange (see above, No. 610). The scheme was approximately 4km in length and ran through gently undulating land from Celbridge to Leixlip, with a mixture of arable, pasture and woodland. The southern part of the scheme runs through an area heavily influenced by 18th-century landscape design, with avenues, woodland and tree-lined field boundaries centred on the early 18th-century house at Castletown. The site was initially identified as two sites but they were excavated under the same licence.

Site 16 (KD011-054)
The site can be divided into three phases. Phase 1, the earliest, consisted of all features which cut the natural subsoil. Phase 2 was the large northerly orientated ditch, and Phase 3 was the final phase of ploughing. Phases 1 and 2 may be contemporary but as explained below, have been dealt with separately.

Nine features were identified in Phase 1, mostly concentrated in the north-western area of the site. In the north-western sector there was a hearth feature, two shallow post-holes, two pits and a possible post-hole. In the south-eastern quadrant there was a linear cut and an oval pit. In the south-western corner was an oval cut. These features suggest a habitation site of some kind. There was, however, no obvious pattern to the post-holes nor enough of them to suggest a structure. The two post- or stake-holes close to the hearth may have been associated with it. Burnt and unburnt bone was found in the pit close to the hearth. It may have been a rubbish-pit. It was truncated on its southern side by a plough-furrow.

Two pits, 0.35m apart, were found in the southern area of the site. Burnt and unburnt bone was found in the fills of one of them. Burnt bone and a sherd of medieval pottery were found in pit C23. The sherd was the only artefact from this phase and therefore suggests a medieval terminus post quem for it.

Phase 2 is represented by a large northerly orientated ditch which cut through the entire site. It did not truncate any of the features described in Phase 1 so may be contemporary with them. It had a C-shaped profile in the south and a rounded V-shaped profile in the north. The fills varied from north to south. The fills of the ditch produced animal bone, cremated bone and two fragments of human skull. The skull fragments were found at the base of the ditch, along with 23 cattle-sized vertebrae fragments. Other cattle parts included a molar, a horn core, a humerus, a metacarpal and a metatarsal. These disarticulated bones were probably dumped into the ditch when it was open. The only artefact found in the ditch fills was an iron blade. Five fragments of cremated animal bone were found in the same fill as the blade.

This feature seems to have been a boundary ditch. It does not correspond to any ditches marked on the first edition OS map so must pre-date the early 19th century.
Phase 3 is represented by nine plough-furrows. They ran across the site from east to west and truncated the large ditch and some other features. They varied in width from 0.8m to 0.3m. Several post-medieval artefacts were found in the furrow fills, including pottery sherds, glass, clay pipe fragments and a nail. A flint flake was found in fill C12. Other artefacts were found in the topsoil during cleaning. These included a silver button, nails and two flint flakes.

Site 17 (KD011-055)
This lay 15.4m to the south-east of Site 16. The area measured 6m by 4m and was visible as two charcoal-rich deposits. The site can be divided into two phases.

Phase 1 is represented by a northerly orientated bottle-shaped cut. It was 4m in total length and 1.08m wide in the oval part. The 1.3m southern projection was 0.25m wide. It was dug into the natural subsoil. It had vertical sides in the flue and gradual concave sides in the main oval section. The base was flat. The main, widest, part of the cut had eight fills. Some of these fills partly filled the flue; two were confined to the flue only. The fills were rich in charcoal and ash, and some contained burnt clay and bone.

At first it was thought that this feature might have been a corn-drying kiln. A portion of one of the charcoal-rich fills was sieved in an attempt to identify some charred seed remains. None were found. All the identified fragments of bone found in the fills were of juvenile pig and had been burned at 300–600°C. Because of the ash deposits and cremated bone fragments it can be suggested that this feature was a pig-roasting pit. It is not possible to determine whether it is contemporary with the features on Site 16.

Phase 2 is represented by an east–west-running furrow, probably contemporary with the furrows on Site 16 to the north. Final post-excavation work has not yet been carried out.
Fiona Reilly, Wood Road, Cratloekeel, Cratloe, Co. Clare, for Valerie J. Keeley Ltd.

Table 15.4 Excavation Summary for Recorded Monument KD011-054 and KD011-055

A second Recorded Monument (KD011-056) dating to the medieval period was found during topsoil removal as part of the Celbridge Interchange Scheme. It was found on the grounds of Collinstown House and consisted of a kiln and wall. The monument was excavated fully and therefore has no surface expression. The details of the excavation are outlined below in **Table 15.5**.

Kildare
2001:626
Site 18, Collinstown
Kiln, wall
98415.069 236781.429
01E1225
Site 18 was found during monitoring of topsoil-stripping of the Northern Link on the Celbridge Interchange (see above, No. 610). The scheme was approximately 4km in length and ran from Celbridge to Leixlip through gently undulating land with a mixture of arable, pasture and woodland. The southern part of the scheme runs through an area heavily influenced by 18th-century landscape design, with avenues, woodland and tree-lined field boundaries centred on the early 18th-century house at Castletown. This site was found in the grounds of Collinstown House, close to Leixlip.
Three main features were identified: a stone-lined kiln, a possible wall and a possible drain. There was no direct stratigraphic relationship between the kiln and the wall.

The kiln
Evidence was found for two phases of kiln use. The first phase was found under the stone phase (Phase 2) and was sealed off from it by a deposit into which the structural stones of Phase 2 were set. A charcoal deposit at the base of the kiln cut represented this phase. The second phase of the kiln was of stone set in a keyhole-shaped cut. The single course of roughly hewn stones was set along the circumference of the bowl in C23, with a 0.8m gap at the flue. The largest stones were placed at the neck of the flue. The cut was orientated in a north-westerly direction. It was 2m wide in the bowl area and 0.8m in the flue section. Its sides were almost vertical while the flue sloped gently down into the bowl. C18 was a charcoal deposit found at the base of the kiln. It has been sampled for cereal remains and other environmental evidence.

C6 represents the destruction phase of the kiln and was confined to within the kiln. It contained some stones that might originally have been part of the kiln structure. Burnt and unburnt animal bone, a sherd of medieval pottery and post-medieval pottery were found in it.

The wall
A wall survived to the north-west of the kiln as a single course, one stone wide for most of its length but two stones wide at its north-eastern end. The destruction phase of this feature is represented by a deposit of loose stone found along the south-eastern edge of the surviving section. The wall may have functioned as a windbreak for the kiln.

It is not possible to establish by artefacts the date of the kiln's use since none were found associated with those phases. Since post-medieval pottery sherds were found in the destruction level it could be suggested that it had a post-medieval destruction date. The presence of two sherds of medieval pottery on site indicates medieval activity in the vicinity or possibly a date for use of the kiln.
Fiona Reilly, Wood Road, Cratloekeel, Cratloe, Co. Clare, for Valerie J. Keeley Ltd.

Table 15.5 Summary for Recorded Monument KD011-056

The Post Medieval Period
A Holy well 'Spa Well' (KD011-007) is located along the Royal Canal to the east of the proposed development site. This well was uncovered during the excavation works associated with the Royal Canal in the 1790s. An extract from Terence O Toole's Dublin Penny Journal (1837) describes the well as follows:

> *'Just beneath the bridge that carries the road over the canal, is one of the most beautiful and abundant spring wells in Ireland - if it was known in old times it would have been sanctified, as most such are in Ireland - but it burst out for the first time from the depths of the earth on the excavation of the canal; and as it was discovered in winter, and as its deep seated source caused it to appear warmer than other more superficial springs, so, immediately there were attributed to*

it virtues of no ordinary degree, and the crowds that in faith (for the Irish are rich in that cardinal virtue,) resorted to it were enormous. While the credulity lasted, the harvest of coach and noddy owners (for jaunting-cars were not yet in fashion,) was immense strings of carriages, miles long, might be seen on Sundays issuing from Dublin, containing crowds anxious to apply, internally ,or externally, its healing waters; and attestations of its curing the blind - restoring the palsied - strengthening the lame, came before the public every day. But alas, the powers of ridicule were brought to bear against it, and one wicked wight drew a caricature in which he represented a broken down noddy as washed by the Leixlip Spa water, and all its spokes and shafts, under the mopping of the jarvey, becoming strong and strait. This certainly was a pity; and no one in the world was served by dissipating such an innocent and salutary delusion, and after all it is not only a beautiful but an extraordinary spring; for if you believe all the neighbours, not a fish or frog will live in its waters; and though there is a floculent, rusty-coloured, ochreous matter constantly rising to the surface of the well, exactly similar to that which is found in spring's strongly impregnated with iron, yet no test, either gallic acid or prussiate of potash, can detect any iron; but in the centre of this floculent matter is found a very red little worm about half en inch long, which all those who have still faith in the salubrity of the well say is the sovereignest remedy alive for a sore leg: nay more, let anyone who has drank over night from 15 to 20 tumblers of punch, and whose head is so hot that it makes the water fizz into which it is put, let him but take a quart or two of the water of this spring on the following morning, and he will lose all his whiskey fever and walk home as cool as a cucumber. I assure you, gentle reader, I have seen sundry making the experiment, and I actually saw them afterwards sober.'

Newly Recorded Monuments

No newly discovered archaeological monuments are located on or within close proximity to the site.

15.6 POTENTIAL IMPACTS ON ARCHAEOLOGY

Archaeological heritage is a non-renewable resource. The overall objective of this assessment of impacts of the proposed development is to ensure that where a potential impact has been identified, that it can be mitigated against to ensure that the archaeological heritage will be available for future generations. This is in accordance with the policies as set out by the County Development Plan and the statutory legislation in relation to archaeology. The potential impacts on the archaeological heritage are assessed here. A potential impact on archaeology may be the removal of a known recorded site or the accidental damage to a previously unknown sub-surface site during construction works. Other impacts may include altering the character or setting of a monument by constructing structures too close to the archaeological sites (i.e. visual impact).

Potential Direct Impacts on Recorded Monuments

The construction phase of the development will consist largely of converting an existing building to advance technology. No recorded monuments exist within the area of the FAB 24 building therefore no direct impacts on the recorded archaeological resource are anticipated.

Indirect Impacts on Recorded Monuments

No indirect impacts (visual impacts) are anticipated as part of this development. The conversions are to take place to an existing building and in an area already established for industrial and manufacturing use. The conversions to FAB 24 will not have any indirect impacts on the archaeological landscape.

Potential Direct Impacts on unknown sub-surface archaeological features

As the proposed development consists of conversions and additions to an existing building, the potential for uncovering archaeological finds, features or deposits in areas of new buildings is low to negligible. Furthermore, archaeological testing of the adjacent FAB 10 and FAB 14 building in 1994 did not reveal anything of archaeological significance.

15.7 MITIGATION

15.7.1 RECORDED ARCHAEOLOGICAL MONUMENTS

As there will be no impact on the Recorded Archaeological Resource no mitigation is necessary here.

15.7.2 POTENTIAL SUB-SURFACE ARCHAEOLOGY

No potential impacts on sub surface archaeological deposits have been identified as part of the proposed development. No mitigation is necessary here therefore.

15.8 SUMMARY

This report was carried out as an Archaeological Impact Assessment to be submitted as part of the planning application associated with the proposed conversions to the FAB 24 building for Intel Ireland Ltd, Leixlip, Co. Kildare. The assessment included desktop research and site inspection to identify areas of archaeological potential on the site. Five recorded monuments are located within 1km of the proposed site. No impacts on the Recorded Monuments are anticipated however, given both the nature of the development and the distance of the monuments from the building. No new archaeological monuments were detected during field inspection.

No mitigation is necessary as part of this project.

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16. INTERACTIONS AND CUMULATIVE EFFECTS

16.1 INTRODUCTION

This chapter describes the interactions between the various impacts identified in the previous sections of the Environmental Impact Statement during both the construction and operational phases of the proposed development.

The project team, in conjunction with the assistance of a variety of specialist environmental consultants, each one an expert in their chosen field, assessed the potential impact arising from the construction and operation of the proposed development. The interaction of environmental aspects was clearly identified at an early stage in the project to be an important factor to be considered in the full evaluation of the environmental impacts associated with the proposed development.

In the interests of clarity, significant interactions and inter-dependencies have in fact been taken into consideration, and are detailed, under each EIA heading. We refer the reader to the relevant sections of the EIS.

16.2 MATRIX OF INTERACTIONS

This chapter provides a simple matrix identifying environmental components and recording where interactions are identified. These are then expanded upon in the text with cross references made to the more detailed assessments outlined in the relevant chapters of the EIS.

Again, for detailed descriptions and accounts, we refer the reader to the relevant chapters of the EIS.

Interaction	Human Beings		Flora & Fauna		Soils, Water & Hydrogeology		Material Assets		Air & Climate		Landscape		Cultural Heritage	
	Constr.	Op.	Constr.	Op.	Constr.	Op.	Constr.	Op.	Const.	Op.	Constr.	Op.	Constr.	Op.
Human Beings			×	×	×	×	×	×	×	×	×	×	×	×
Flora & Fauna	×	×			×	×	×	×	√	×	×	×	×	×
Soils, Water & Hydro-geology	×	×	×	×			×	×	×	×	×	×	×	×
Material Assets	×	×	×	×	×	×			×	×	×	×	×	×
Air & Climate	×	×	√	×	×	×	×	×			×	×	×	×
Landscape	×	×	×	×	×	×	×	×	×	×			×	×
Cultural Heritage	×	×	×	×	×	×	×	×	×	×	×	×		

Table 16.1 Interaction of Impacts arising during Construction and Operational Stages

Constr. = construction stage

Op. = operation stage

✓= interaction anticipated

×= no interaction anticipated

16.3 HUMAN BEINGS

No significant interactions between human beings and other environmental topics are likely to occur because Intel has carefully integrated into the physical, economic and social fabric of the local community without any undue effects on the overall settlement pattern of the Town. The proposed extension will assist Intel in continuing its economic and social links with Leixlip, in a manner that is in accordance with the proper planning and development of the area.

Traffic impacts, which in the past have been of significant concern, have been minimised through the provision of new access roads and the continual improvement of the nearby national routes. In addition the commitment to the implementation and ongoing development of a Mobility Management Plan will minimise any such impacts.

16.4 FLORA AND FAUNA

There may be interactions between fauna [birds] and noise. Residual impacts may still occur with regard to the disturbance of breeding birds at the using woodland near the proposed new Hydrogen tank site as a result of noise or visual disturbance. It is likely that there is an existing level of tolerance by birds in this area and that breeding may not be curtailed to a significant level. The design of the development and specified mitigation measures will reduce impacts to sensitive ecological receptors from the construction and operation of the proposed development. The impact is predicted to be short-term and localised.

16.5 SOILS, WATER AND HYDROGEOLOGY

No significant interactions between soils, water, hydrogeology and other environmental topics are likely to occur due to the implementation of the mitigation measures outlined in the previous sections and within Intel's environmental management plan.

16.6 MATERIAL ASSETS

No significant interactions between material assets and other environmental topics are likely to occur because Intel has carefully integrated into the infrastructure of locality without any undue effects on the availability and capacity for other land-users. This integration has included upgrading or extending installed capacity where necessary – such as the additional substation and water storage facilities proposed within this application.

16.7 AIR & CLIMATE

No significant interactions between air or climate and other environmental topics are likely to occur because effects will be minimised onsite wherever practical using measures described in previous chapters. Residual impacts associated with climate include ongoing releases of emissions with global warming potential in common with all domestic, commercial and industrial combustion sources in Ireland including heating systems, vehicles and indirectly from the use of electricity

16.8 LANDSCAPE

No significant interactions between landscape and other environmental topics are likely to occur because the proposed development will give rise to effects that will only be seen in the context of an established industrial site. Changes to the appearance will be discernible from distant viewing points but will appear minor and will not significantly alter the appearance or character of the area.

16.9 CULTURAL HERITAGE

No significant interactions between cultural heritage and other environmental topics are likely to occur because the site of the proposed development is highly disturbed by construction activity. The area was subjected to detailed archaeological investigations (including trial trenching) in 1994 and was found to have no archaeological significance or potential. One protected structure lies within the environs of the proposed development area, i.e. Nelson's Cottage. There are no proposals to alter the cottage in any way as part of this application.

16.10 BROADER INTERACTIONS

Each section of the EIS considers how this proposed project will incrementally contribute to the establishment of the overall envelope of effects caused by the development of the proposed facility.