Volume II - Environmental Impact Assessment Report

Proposed Residential Development

Lands at Capdoo & Abbeylands, Clane, Co. Kildare

Westar Investments Ltd.

November 2019

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1.0 INTRODUCTION

1.1 Purpose of this Report

Hughes Planning and Development Consultants have been commissioned by Westar Investments Ltd. (referred to as the Applicant throughout), to prepare an Environmental Impact Assessment Report for a strategic housing development application for the proposed development of a residential scheme at Capdoo & Abbeylands, Clane, Co. Kildare.

A full description of the proposed development lands together with a description of the proposed development is provided in Chapter 2.0 of this document. In summary, the proposed development comprises the construction of 305 no. dwellings (193 no. apartments/maisonette units/duplex units & 112 no. houses), a childcare facility and a linear park on 10.36Ha of land. The proposal also includes on curtilage car parking, private open space, internal roads, footpaths, cycle tracks, public open space, landscaping, boundary treatments, street lighting, SuDS drainage, piped and other services and ancillary site development works necessary to facilitate the development.

The purpose of an Environmental Impact Assessment Report is to assess the likely and significant impact on the environment of the proposed development in parallel with the project design process. The potential impacts will be dependent on the nature, size and location of the proposed development.

This Environmental Impact Assessment Report has been prepared in accordance with the Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (published in August 2018) and the 2017 Draft EIA Guidelines, published by the EPA in August 2017, as well as previously issued Irish and European EIA Guidelines and Guidance Documents. We would also note that the pre-application discussions with Kildare County Council and An Bord Pleanála, including the Board's opinion, informed the content of the EIAR.

1.2 EIA Legislation

Environmental Impact Assessment requirements are governed by Directive 2014/52/EU, which amends the previous EIA Directive (Directive 2011/92/EU). Article 2 of Directive 2014/52/EU provides that Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with the Directive by 16 May 2017. The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 transposed the provisions of Directive 2014/52/EU into Irish law by amending the Planning and Development Act 2000, the Planning and Development (Housing) and Residential Tenancies Act 2016, the Planning and Development (Amendment) Act 2018 and the Planning and Development Regulations 2001.

The objective of the EU Directive (Directive 2011/92/EU), as amended by Directive 2014/52/EU, is to ensure a high level of protection of the environment and human health, through the establishment of minimum requirements for environmental impact assessment, prior to development consent being given, of public and private developments that are likely to have significant effects on the environment.

1.3 Definition of EIA and EIAR

EU Directive 2014/52/EU defines 'environmental impact assessment' (EIA) as:

'a process consisting of:

(a) the preparation of an Environmental Impact Assessment Report (EIAR) by the developer;
(b) the carrying out of consultations;
(c) the examination by the competent authority of the EIAR, any supplementary information provided, where necessary, by the developer and relevant information received through consultations with the public, prescribed bodies and any affected Member States
(d) the reasoned conclusion of the competent authority on the significant effects of the project on the environment, and

(e) the integration of the competent authority's reasoned conclusion into any development consent decision.'

The definition of EIA provides for a clear distinction between the process of environmental impact assessment to be carried out by the competent authority (in this instance An Bord Pleanála) and the preparation by the developer of an Environmental Impact Assessment Report (EIAR).

The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018, defines an EIAR as:

'A report of the effects, if any, which proposed development, if carried out, would have on the environment and shall include the information specified in Annex IV of the Environmental Impact Assessment Directive.'

Pursuant to Article 5(1)(a) to (f) of the Directive, an EIAR is required to provide the following information:

(a) A description of the project comprising information on the site, design, size and any other relevant features of the project;
(b) A description of the likely significant effects of the project on the environment;
(c) A description of the features of the project and/or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;
(d) A description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment;
(e) A non-technical summary of the information referred to in points (a) to (d); and
(f) Any additional information specified in Annex IV of the Directive/Schedule 6 to the 2001 Regulations, as amended, relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected.

As is required by Annex IV of the 2014 Directive, this EIAR addresses matters including proposed demolition works, risks to human health, major accidents/disasters, biodiversity, climate change and cumulative effects with other existing and/or approved projects.

The EPA Guidelines state that the main purpose of an EIAR *'is to identify, describe and present an assessment of the likely significant impacts of a project on the environment. This informs the CA's assessment process, its decision on whether to grant consent for a project and, if granting consent, what conditions to attach.'*

1.4 The Need for an Environmental Impact Assessment Report (Screening)

Screening is the term used to describe the process for determining whether a proposed development requires an EIA by reference to mandatory legislative threshold requirements or by reference to the type and scale of the proposed development and the significance or the environmental sensitivity of the receiving baseline environment.

Annex I of the EIA Directive 85/337/EC requires as mandatory the preparation of an EIA for all development projects listed therein. Schedule 5 (Part 1) of the Planning & Development Regulations 2001 (as amended) transposes Annex 1 of the EIA Directive directly into Irish land use planning legislation. The Directive prescribes mandatory thresholds in respect to Annex I projects.

Annex II of the EIA Directive provides EU Member States discretion in determining the need for an EIA on a case-by-case basis for certain classes of project having regard to the overriding consideration that projects likely to have significant effects on the environment should be subject to EIA. Schedule 5 (Part 2) of the Planning and Development Regulations 2001 (as amended) the regulations, sets the following mandatory thresholds for EIA preparation for each of the Annex II projects under Class 10:

a) *Industrial estate development projects, where the area would exceed 15 hectares.*

b) (i) Construction of more than 500 dwelling units.

(ii) Construction of a car-park providing more than 400 spaces, other than a car-park provided as part of, and incidental to the primary purpose of, a development.

(iii) Construction of a shopping centre with a gross floor space exceeding 10,000 square metres.

(iv) Urban development which would involve an area greater than 2 hectares in the case of a business district, 10 hectares in the case of other parts of a built-up area and 20 hectares elsewhere.

(In this paragraph, "business district" means a district within a city or town in which the predominant land use is retail or commercial use.)

The subject development is not of a type or size that would require mandatory EIA under Annex I. With respect to Annex II, the subject proposal would not constitute an "infrastructure project" under Class 10 given the no. of units proposed and the size of the subject site. However, it was considered beneficial to prepare an EIAR to assist An Bord Pleanala to assist with their determination of this application.

1.5 The Scope of the Environmental Impact Assessment Report (Scoping)

'Scoping' is a process of deciding what information should be contained in an EIAR and what methods should be used to gather and assess that information. It is defined in the EC guidance (Guidance on EIA Scoping, EC, 2001) as:

> *'determining the content and extent of the matters which should be covered in the environmental information to be submitted in the EIAR'.*

A scoping exercise to identify the issues that are likely to be most important during the EIA process was carried out by the applicant, design team and EIAR consultants and informed the format of this EIAR.

The scoping of the EIAR has also taken into consideration the proposed development with specific reference to the surrounding environment, adjoining properties and any third-party concerns, the existing planning history and ensuring amenity impacts are reduced, removed or where applicable, mitigated to an appropriate level. The EIAR prepared for the scheme has endeavoured to be as thorough as possible.

In this context the following topics/issues have been reviewed and addressed in the context of the proposed development:

- Project Description and Alternatives Examined;
- Planning and Development Context;
- Population and Health;
- Biodiversity;
- Land, Soils, Geology and Hydrogeology;
- Water (Hydrology);
- Noise and Vibration;
- Air Quality and Climate;
- Material Assets;
- Archaeological, Architectural and Cultural Heritage;
- Landscape and Visual Amenity;
- Interaction between Environmental Factors;
- Principle Mitigation and Monitoring Measures; and
- Non-Technical Summary.

In addition to the above a series of standalone reports have been prepared to accompany the planning application and which have helped inform the above chapters of the EIAR where relevant.

1.6 Competency and EIAR Project Team

It is a requirement that the EIAR must be prepared by competent experts. The amended EIA Directive (Directive 2014/52/EU) states the following in relation to the persons responsible for preparing the environmental impact assessment reports:

> *'Experts involved in the preparation of environmental impact assessment reports should be qualified and competent. Sufficient expertise, in the relevant field of the project concerned, is required for the purpose of its examination by the competent authorities in order to ensure that the information provided by the developer is complete and of a high level of quality'.*

For the preparation of this EIAR, the Applicant engaged Hughes Planning and Development Consultants to direct and coordinate the preparation of the EIAR and a team of qualified specialists were engaged to prepare individual chapters.

In order to outline compliance with this requirement of the amended directive and in line with emerging best practice the EIAR states the names of the environmental consultants who have prepared each element of the EIAR and lists their qualifications and relevant experience; demonstrating that the EIAR has been prepared by competent experts.

The consultant firms and their inputs are set out in Table 1.1 below. Details of competency, qualifications and experience of the lead author of each chapter and contributors to the applicable are outlined in the table below.

Organisation	Lead Consultant	Topics/Inputs
Hughes Planning and Development Consultants 70 Pearse Street, Dublin 2. T: 01 539 0711 E: info@hpdc.ie or margaret.commane@hpdc.ie	Mr Kevin Hughes - Director, Hughes Planning and Development Consultants – BA, MRUP Ms. Margaret Commane – Associate, Hughes Planning and Development Consultants – BA, MPLAN	• Introduction and Methodology; • Project Description and Alternatives Examined; • Population and Human Health • Interactions of the Foregoing; • Principle Mitigation and Monitoring Measures; and • Non-Technical Summary
Open Field Ecological Services 12 Maple Avenue, Carpenterstown, Dublin 15. T: 01 823 6145 E: padraic@openfield.ie	Mr. Pádraic Fogarty - Director, Open Field Ecological Services - MSc	• Biodiversity
Redkite Environmental Huntersmoon, Ballykeane Road, Redcross Co. Wicklow T: 0879170693 E: siobhan@redkite.ie	Ms. Siobhan Maher - Director, Redkite Environmental – BSc, M.Tech	• Land and Soils; • Water; • Air Quality & Climate; • Noise and Vibration; and • Material Assets – waste management.
Byrne Mullins & Associates 7 Cnoc na Greine Square, Kilcullen, Co. Kildare T: 045 480688 E: byrnemullins@eircom.net	Mr. Martin Byrne - Director, Byrne Mullins & Associates – BA, MA	• Archaeology, Architectural and Cultural Heritage
Landmark Designs Ballinafagh, Prosperous, Naas, Co. Kildare T: (045) 893 810 E: gwenlandmarkdesigns@gmail.com	Ms. Gwen Tierney - Environmental Consultant, Landmark Designs Ltd. – B.Ag.Sc. Land. Hort.	• Landscape and Visual Impact

Brian Connolly Consulting Engineers The Studio, Woods Way, Abbeyland, Clane, Co. Kildare T: 045 892 211 E: bca.brianc@gmail.com	Mr. Brian Connolly - Director, Brian Connolly Consulting Engineers - BEng	• Material Assets - traffic, services and infrastructural

Table 1.1 EIAR Specialist Consultant

1.7 Structure of Environmental Impact Assessment Report

The EIAR is sub divided into 3 no. volumes as follows:

- Volume I - Non-Technical Summary;
- Volume II - Environmental Impact Assessment Report; and
- Volume III - Appendices to Environmental Impact Assessment Report.

Volume II is presented as 14 no. chapters as outlined in the Table 1.2 below.

Chapter	Chapter Title	Chapter Description
1	Introduction and Methodology	Sets out the purpose, methodology and scope of the document.
2	Project Description and Alternatives Examined	Sets out the description of the site, design and scale of development, considers all relevant phases from construction through to existence and operation together with a description and evaluation of the reasonable alternatives studied by the developer including alternative locations, designs and processes considered; and a justification for the option chosen taking into account the effects of the project on the environment.
3	Planning and Development Context	Describes the site context, the planning history of the subject site and the surrounding site and the local, regional and national policies that the proposed development will be assessed against.
4	Population and Health	Describes the demographic and socio-economic profile of the receiving environment and potential impact of the proposed development on population, i.e. human beings, and human health.
5	Biodiversity	Describes the existing ecology on site and in the surrounding catchment, and assesses the potential impact of the proposed development and mitigation measures incorporated into the design of the scheme.
6	Land, Soils, Geology and Hydrogeology	Provides an overview of the baseline position, the potential impact of the proposed development on the site's soil and geology and impacts in relation to land take and recommends mitigation measures.
7	Water (Hydrology)	Provides an overview of the baseline position, the potential impact of the proposed development on water quality and quantity and recommends mitigation measures.
8	Noise and Vibration	Provides an overview of the baseline noise environment, the potential impact of the proposed development and recommends mitigation measures.
9	Air Quality and Climate	Provides an overview of the baseline air quality and climatic environment, the potential impact of the proposed development, the vulnerability of the project to climate change, and recommends mitigation measures.
10	Material Assets	Describes the existing traffic, waste management and services and infrastructural requirements of the proposed development and the likely impact of the proposed development on material assets.

11	Archaeological, Architectural and Cultural Heritage	Provides an assessment of the site, and considers the potential impact of the proposed development on the local archaeology, architectural and cultural heritage; and recommends mitigation measures.
12	Landscape and Visual Impact	Provides an overview of the baseline position, the potential impact of the proposed development on the landscape appearance and character and visual environment, and recommends mitigation measures.
13	Interactions between Environmental Factors	Describes the potential interactions and interrelationships between the various environmental factors discussed in the above chapters.
14	Principle Mitigation and Monitoring Measures	Sets out the key mitigation and monitoring measures included in the EIAR document for ease of reference.

Table 1.2 EIAR Chapter Outline

Each chapter of this EIAR assesses the direct, indirect, cumulative and residual impact of the proposed development for both the construction and operational stage of the proposed development.

In preparing the EIAR the following regulations and guidelines were considered:

- The requirements of applicable EU Directives and implementing Irish Regulations regarding Environmental Impact Assessment;
- Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017)
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – DRAFT (Environmental Protection Agency, August 2017).
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning and Local Government, 2018).

In addition, specialist disciplines have had regard to other relevant guidelines, and where relevant these are noted in individual chapters of the EIAR.

1.8 Cumulative Projects

The assessment of impacts has considered the following project for their potential cumulative effects, where relevant:

Location: Capdoo, Clane, Co. Kildare (c. 600m north-west of application site)

ABP Ref. ABP-304632 Strategic Housing Development application approved by An Bord Pleanála on 26th September 2019.

Development: Demolition of all existing structures on site, including 1 no. habitable house, agricultural structures and domestic sheds; development of 366 no. new residential units; a childcare facility (316sqm GFA approx.); a new Link Road connecting the R407 (College Road/Kilcock Road) to Capdoo Park and the R403 (Celbridge Road) beyond, incorporating cycle tracks and footpaths on both sides of the carriageway, together with a new roundabout on the R407 and all necessary upgrades to existing junctions and road realignments at both the R407 and Capdoo Park; associated internal access roads, pedestrian and cycle paths and linkages; open space; and, all associated site and development works. The 366 no. residential units comprised of: 6 no. one-bedroom apartments; 118 no. two-bedroom apartments; 12 no. one-bedroom duplex apartments; 36 no. three-bedroom duplex apartments; 19 no. two-bedroom houses; 75 no. three-bedroom houses; 77 no. four-bedroom houses; and 12 no. five-bedroom houses.

1.9 Consultation

A dedicated website for this proposed development is established and the EIAR is available at www.clanekda1shd.com.

Additionally, prior to lodging this application, the required information has been issued for the Department of Housing, Planning and Local Government's EIA Portal. The purpose of this tool is to inform the public, in a timely manner, of applications that are accompanied by an EIAR. The portal provides a URL link.

Extensive pre-planning consultation was held with Kildare County Council in advance of lodging this application. Guidance received is integrated into the design and in turn is assessed in this EIAR.

Where relevant specialists engaged with prescribed bodies and the details of advice received is provided in the individual chapters of this EIAR. A Notice of Pre-Application Consultation Opinion was received from An Bord Pleanála following the pre-application consultation meeting and it contained details of the prescribed bodies to be notified of the making of this application. We can confirm that the following prescribed bodies have received a copy of the application including the EIAR:

- Irish Water;
- Transport Infrastructure Ireland;
- Inland Fisheries; and
- Kildare County Childcare Committee.

1.10 Statement of Difficulties Encountered

No exceptional difficulties were experienced in compiling the necessary information for the proposed development. Where any specific difficulties were encountered these are outlined in the relevant chapter of the EIAR.

2.0 DESCRIPTION OF PROPSED DEVELOPMENT AND ALTERNATIVES CONSIDERED.

2.1 Introduction

This section of the EIAR has been prepared by Hughes Planning and Development Consultants, in conjunction with NDBA Architects. More specifically, this chapter of the EIAR was prepared jointly by Mr. Kevin Hughes, Director, and Ms. Margaret Commane, Associate, with Hughes Planning and Development Consultants.

Mr. Kevin Hughes of Hughes Planning and Development Consultants, graduated from University College Dublin (UCD) with a Masters in Regional and Urban Planning (MRUP) in 2002, having previously completed a Bachelor of Arts Degree in Sociology from National University of Ireland in 1999. Kevin has over 18 years professional experience in the field of planning and development consultancy, which has included providing consultancy services in respect of several major urban regeneration projects including EIA. Kevin is currently the Director of Hughes Planning and Development Consultants.

Ms. Margaret Commane of Hughes Planning and Development Consultants, graduated from University College Cork (UCC) with a Masters in Planning and Sustainable Development (MPLAN) in 2012, having previously completed a Bachelor of Arts Degree in Geography and Legal Science from National University of Ireland in 2010. Margaret has over 7 years professional experience in the field of planning and development consultancy, which has included providing consultancy services in respect of several major urban regeneration projects including EIA. Margaret is currently an Associate in the Practice of Hughes Planning and Development Consultants.

It provides a detailed description of the project together with details of the existing environment as well as explaining the evolution of the scheme design through the reasonable alternatives examined. In accordance with Article 5(1)(a) of the 2011 Directive, as amended by Directive 2014/52/EU, the description of the proposal should comprise *"…information on the site, design, size and other relevant features of the project*".

2.2 Site Location and Context

The subject site consists of a large irregularly-shaped parcel of land, 10.36Ha in size, and comprises of four undeveloped agricultural fields situated on the eastern side of Regional Road R403 in the eastern environs of Clane Town, c. 650m from the Town Centre. Vehicular access is provided to the site via the Brooklands Housing Estate and the existing Alexandra Walk/The Avenue roundabout.

Figure 2.1 Aerial view of subject site (red outline) in the context of the immediate area.

The site is situated within close proximity to a number of existing residential developments including: 'The Brooklands', 'Abbey Park' and 'Alexander Walk' Housing Estates. These developments provide a mix of semi-detached and terraced dwellings. The subject site is located c. 400m from existing supermarket facilities provided by a Tesco Metro and Lidl on Regional Road R403, with this road also providing access to Bus Éireann Route Nos. 120, 121, 126 and 126 which provide direct access to Dublin City Centre and University College Dublin. In addition, Kenneally's Bus Service provides direct transport to Naas via bus stops situated c. 650m from the site within the centre of Clane town.

Figure 2.2 Aerial view of subject site (red outline) in the context of Clane Town.

As illustrated in the above images, the site is situated within close proximity to a number of existing residential developments including: 'The Brooklands' and 'Alexander Walk' Housing Estates. These developments provide a mix of semi-detached and terraced dwellings. The subject site is located c. 400m from existing supermarket facilities provided by a Tesco metro and Lidl on Regional Road R403, with this road also providing access to Bus Éireann route Nos. 120, 121, 126 and 126 which provide direct access to Dublin City Centre and University College Dublin. In addition, Kenneally's Bus Service provides direct transport to Naas via bus stops situated c. 650m from the site within the centre of Clane town.

Characteristics of the subject site which are of particular note to the various disciplines/specialists involved in preparation of the EIAR are outlined in the individual chapters.

2.3 Nature and Extent of Proposed Development

In summary, the Applicant is applying to An Bord Pleanála, under the Strategic Housing Development process, for the following (as per the public notices):

> *'(i) construction of 305 no. residential dwellings, comprising 112 no. houses, 20 no. maisonette units, 139 no. apartments in 4 no. blocks varying from 3 to 4 storeys in height (Block C being 4 storeys, Block D being 3 storeys, Block F being 4 storeys and Block L being 4 storeys) and 34 no. duplex units in 8 no. 3 storey blocks; (ii) construction of a 340sqm childcare facility (part of the ground floor of Apartment Block D) adjacent to the site's westernmost entrance (off the Brooklands Residential Estate) with capacity for up to 50 no. children. The childcare facility is provided with 18 no. car parking spaces and 8 no. bicycle parking spaces for drop-off and staff parking; (iii) construction of a 1.88 hectare linear park adjacent to the River Liffey; (iv) provision of 3 no. vehicular/pedestrian accesses (with associated works to footpaths and verges), 2 no. off the Brooklands*

Housing Estate Road and 1 no. off Alexandra Walk, and provision of 1 no. pedestrian only access (with associated works to footpaths and verges) off the Brooklands Housing Estate Road; and (v) all associated site, landscaping and infrastructural works, including foul and surface water drainage, lighting, attenuation areas, bin storage, open space areas, boundary walls and fences, internal roads and cycle paths/footpaths.'

Figure 2.3 Site layout plan of proposed development of 305 no. residential dwellings.

The layout of the proposed development has been informed by the topography of the subject site, its proximity to the River Liffey and adjacent residential housing estates, existing hedgerows featuring on site, the feedback received from Kildare County Council and An Bord Pleanala at pre-planning stage, the policies and objectives set out for the Key Development Area 1 in the Clane Local Area Plan 2017 – 2023 as well a Flood Risk Assessment carried out by IE Consulting and inputs from the EIAR consultants.

2.3.1 Demolition

There is no demolition proposed with this application as the subject site is currently devoid of buildings/hard surfacing.

2.3.2 Proposed Apartments, Duplexes and Maisonette Units

The development proposal will include the construction of 193 no. apartment/duplex apartment/maisonette units on the application site. Apartment/duplex apartment units (173 no. units in total) will be provided within 12 no. purpose-built blocks, scattered throughout the development. More, specifically:

Apartment Block	No. of Storeys	Total No. of Units	Position on the Site
Apartment Block A	3	8 no.	North-western corner
Apartment Block B	3	10 no.	North-western corner
Apartment Block C	4	16 no.	Western development boundary
Apartment Block D	4 (crèche at gf level)	9 no.	Western development boundary
Apartment Block E	3	8 no.	North-western corner
Apartment Block F	4	40 no.	South-eastern corner
Apartment Block G	3	10 no.	Eastern development boundary
Apartment Block H	3	8 no.	Eastern development boundary
Apartment Block I	3	8 no.	Eastern development boundary
Apartment Block J	3	8 no.	Eastern development boundary
Apartment Block K	3	8 no.	Eastern development boundary
Apartment Block L	3	40 no.	North-eastern corner

Table 2.1 Break-down of apartments featuring in the proposed development.

In addition to the apartment/duplex apartment blocks, 20 no. maisonette units, separated into 8 no. unit types, are also provided throughout the application site. Please refer to the architectural drawings, prepared by Brian Connolly Associates, and the Statement of Consistency & Planning Report, prepared by Hughes Planning and Development Consultants, for further details regarding the proposed apartment/duplex apartment units.

2.3.3 Proposed Dwellings

The development proposal will include the construction of 112 no. houses on the application site. The scheme caters for growing families and those trading up from apartment living, offering 2-bedroom, 3-bedroom and 4-bedroom dwellings in various configurations. The dwelling units will be categorised in 10 no. dwelling types which can be summarised as follows:

House Type	No. of Storeys	No. of Bedrooms (No. of Persons)	Total No. of Units
A	2	4(7P)	38 no.
AD	2	4(7P)	6 no.
B	2	3(6P)	29 no.
BD	2	3(5P)	3 no.
D	2	3(5P)	1 no.
DD	2	3(5P)	1 no.
E	2	3(5P)	11 no.
ED	2	3(5P)	3 no.
F	2	2(4P)	4 no.
FG	2	2(4P)	16 no.

Table 2.2 Break-down of dwellings featuring in the proposed development

Please refer to the Architectural Drawings, prepared by Brian Connolly Associates, and the Statement of Consistency & Planning Report, prepared by Hughes Planning and Development Consultants, for further details regarding the various dwelling types and layouts.

2.3.4 Proposed Creche

The proposed development includes a 340sq.m crèche contained within the ground floor level of Apartment Block D within close proximity to the site's western boundary and accessible via the new access route provided from Brooklands Residential Estate to the south of the site. The crèche will accommodate 50 no. children and will provide 11 no. of jobs in childcare services. The creche will be provided with 18 no. parking spaces, for both staff and crèche drop off, and 8 no. bicycle parking spaces.

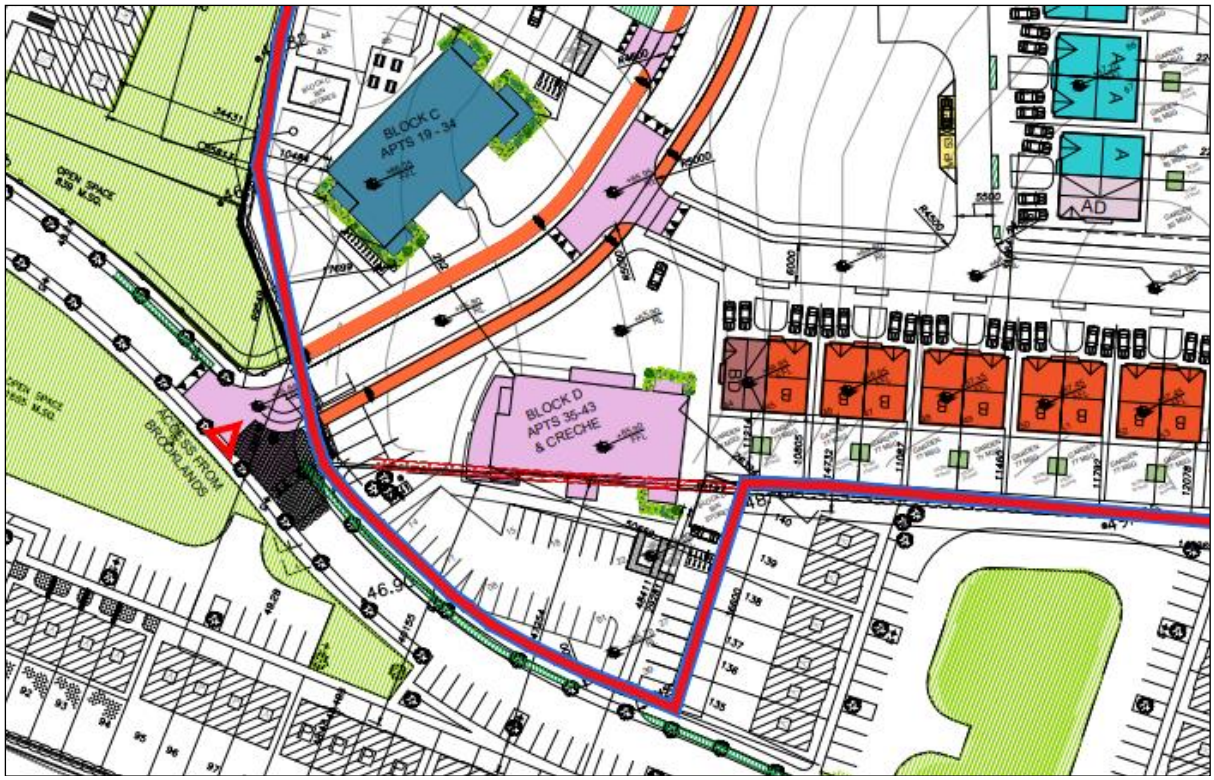

Figure 2.4 Excerpt from site layout plan showing location of the proposed creche

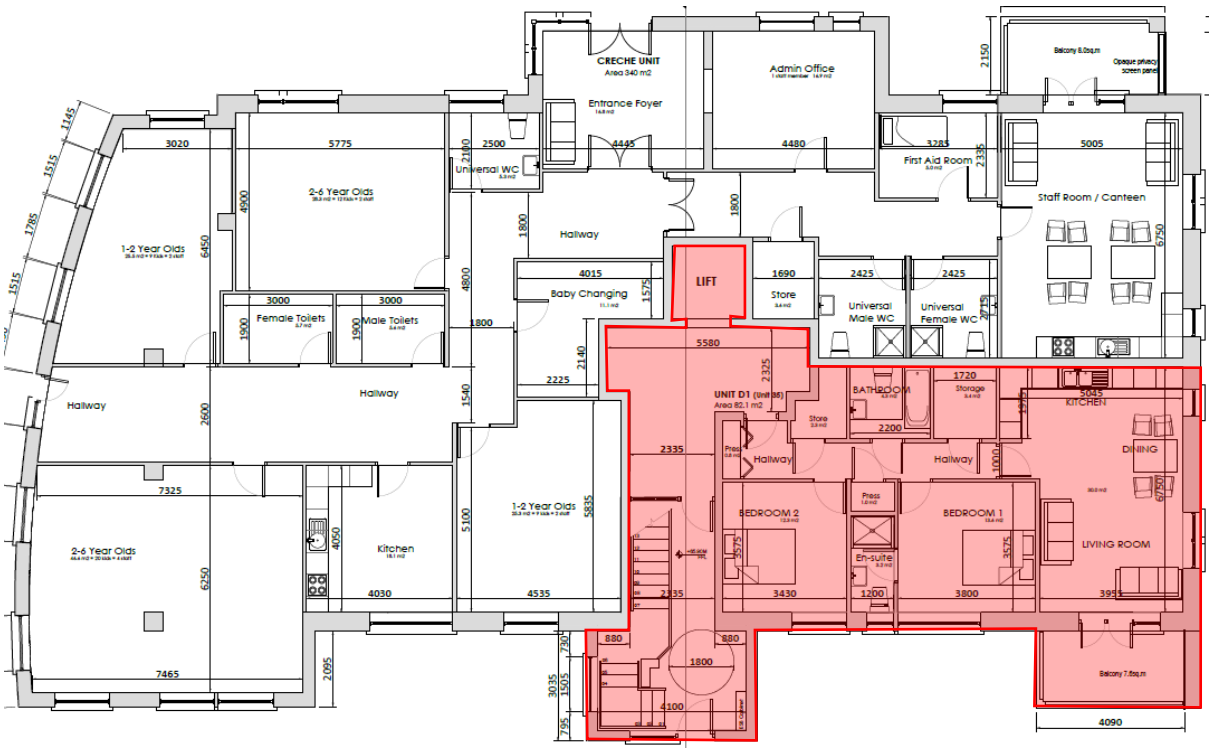

Figure 2.5 The ground floor plan of Apartment Block D accommodates 1 no. residential apartment and access to the upper floor residential units (red outline) and the proposed crèche facility.

2.3.5 Access and Car/Bicycle Parking

The site is situated within close proximity to a number of existing residential developments including: 'The Brooklands' and 'Alexander Walk' Housing Estates. These developments provide a mix of semi-detached and terraced dwellings. The subject site is located c. 400m from existing supermarket facilities provided by a Tesco metro and Lidl on Regional Road R403, with this road also providing access to Bus Éireann Route Nos. 120, 121, 126 and 126 which provide direct access to Dublin City Centre and University College Dublin. In addition, Kenneally's Bus Service provides direct transport to Naas via bus stops situated c. 650m from the site within the centre of Clane town.

The proposed development includes a total of 533 car parking spaces are provided throughout the proposed development. Of these, 256 no. car parking spaces serve the proposed apartments, 224 no. spaces to serve the houses and and 55 no. visitor parking spaces. The development also provides 18 no. parking spaces to serve the crèche facility based on a provision of 0.5 spaces per 1 no. staff member (11) and 1 no. space per 4 no. children (50).

Further to vehicular parking, the development provides a total of 508 no. bicycle parking spaces, inclusive of 500 no. spaces to serve the proposed apartments/maisonettes/duplex units and 8 no. spaces to serve the creche facility, based on a provision 1 spaces per 5 no. staff member (11) and 1 no. space per 10 no. children (52).

2.3.6 Open Space and Landscaping

Public/Communal Open Space

As illustrated in the above site layout plan, the site layout provides for a considerable separation distance between the proposed residential units and the River Liffey to the east of the site. The development accommodates appropriately designed communal/public open space to serve the development supplemented with additional smaller open spaces, featuring playgrounds and landscaped areas provided throughout the development equating to an overall area of 3.15Ha.

The scheme has been designed with an ample areas of public open space with large landscaped areas adjacent to the River Liffey being provided and additional pocket parks, play areas and landscaped areas being provided throughout the development. These public open space areas are located in close proximity to the proposed units and have windows fronting onto them providing passive surveillance and ensuring the safety/security/enjoyment of users of these spaces. The linking of the linear park provided along the eastern interface to the River Liffey walkway, as well as the provision of access through existing residential estates the south, allows for active and passive use by local residents in the surrounding area and ensures cohesion and integration between existing and incoming residents of the area.

Please refer to the Green Infrastructure Strategy/Landscape Design Rationale, prepared by Landmark Designs Limited, for further information regarding open space provision.

Private Open Space

The houses proposed within the scheme provide for private open space in accordance with the standards set out within the Kildare County Development Plan which require 55sq.m (2 bed), 60sq.m for 3-bedroom houses or less and 75sq.m for four-bedroom dwellings located behind the front building line of the house. Many of the proposed dwellings significantly exceed these Development Plan minimums for private open space provision, with generous rear gardens provided wherever possible.

The apartment/duplexes/maisonette units provide for private open space which complies with or exceeds the standards set out within the Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities, 2018, which requires 5sq.m for one-bedroom apartments, 6sq.m for two-bedroom, three-person apartments, 7sq.m for two-bedroom, four-person apartments and 9sq.m for three-bedroom apartments.

2.3.7 Services and Proposed Infrastructure Works

Foul Sewer

The foul drainage system for the site has been designed having regard to the topography of the site. It is proposed to divide the foul sewer into two catchments. Catchment 1 (serving 163 no. unit and the creche) will involve the western part of site and will connect to the Abbey Park pumping station via the Brooklands Housing Estate and Catchment 2 (serving the remaining 142 no. units) will involve the eastern part of the site and will connect to the Abbey Park pumping station via the Alexandra Walk Housing Estate.

Please refer to Section 4.0 of the Infrastructure Design Report and associated engineering drawings, prepared by Brian Connelly Associates, for further information.

Surface Water Drainage

It is proposed that the surface water from the proposed development will be collected by a surface water drainage system using tradition pipe-work and manholes laid along the main access roads collecting run-off from impermeable road surfaces via gullies and adjoining areas. SUDS will also be incorporated to reduce run-off volumes and improve run-off water quality.

The surface water drainage system for the scheme has been designed with 2 no. catchments. The surface water will be attenuated in underground 'stormtech' systems before discharging to the open drain at a controlled rate.

Please refer to Section 3.0 of the Infrastructure Design Report and associated engineering drawings, prepared by Brian Connelly Associates, for further information.

Water Supply

Water supply to the subject site will be provided via an existing 150mm diameter watermains at the south-west boundary entrance off Brooklands Housing Scheme. A 150mm diameter spine water main will be provided along the main access road through the subject site with a number of 100mm diameters looped watermains provided along local streets within the development. A connection is main back to the existing 150mm watermains at Brooklands Housing Estate at the bottom south-west corner.

Please refer to Section 5.0 of the Infrastructure Design Report and associated engineering drawings, prepared by Brian Connelly Associates, for further information.

Road/Junction Upgrades

Access to the subject site will be provided via 3 no. vehicular/pedestrian accesses, 2 no. off the Brooklands Housing Estate Road and 1 no. off Alexandra Walk, and 1 no. pedestrian only access off the Brooklands Housing Estate Road.

Please refer to Section 2.0 of the Infrastructure Design Report and associated engineering drawings, prepared by Brian Connelly Associates, for further information.

2.3.8 Phasing of Development

The proposed development will be constructed in 4 no. phases (A, B, C & D). The diagram included in Figure 2.6 overleaf indicates the phasing of the proposed development.

Figure 2.6 Proposed phasing of development for the proposed residential development.

2.4 Alternatives Examined

The EIA Directive (2014/52/EU) requires that Environmental Impact Assessment Reports include *'a description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.'*

The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 describe alternatives as follows:-

> *"(d) A description of the reasonable alternatives studied by the person or persons who prepared the EIAR, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the proposed development on the environment."*

Reasonable alternatives may include project design proposals, location, size and scale, which are relevant to the proposed development and its specific characteristics. The Regulations require that an indication of the main reasons for selecting the preferred option, including a comparison of the environmental effects to be presented in the EIAR.

This chapter provides an outline of the main alternatives examined during the design phase. It sets out the main reasons for choosing the development as proposed, taking into account and providing a comparison on the environmental effects. For the purposes of the Regulations, alternatives may be described at three levels:

i. Alternative Locations
ii. Alternative Designs
iii. Alternative Processes

2.4.1 Alternative Locations

Given the zoning of the subject site in the Clane Local Area Plan 2017-2023, and having regard to the project's objectives, no reasonable alternative locations were considered. The rationale for the subject project is to provide a residential development with ancillary facilities in a landscaped setting on Residential Zoned lands in close proximity to Clane Town Centre. The proposal is predicated on the zoning applying to the site for residential development in the Clane Local Area Plan 2017-2023, whereby new residential development is envisaged. It is within this statutory planning policy context that all alternatives have been considered.

2.4.2 Alternative Uses

In addition to residential use, there are other land uses which are permitted in principle on these lands. It is not considered that an alternative comprising one of the alternative uses would result in the best use of these lands, particularly having regard to the general acknowledged need for housing. The environs of the subject site are largely residential in nature interspersed with some commercial uses. In this context, the proposal now the subject of this application comprises appropriate land uses in accordance with the proper planning and sustainable development of the area.

2.4.3 Description of Alternative Processes

Given the zonings of the subject site, and the nature of the proposed development, no reasonable alternative processes were studied.

2.4.4 Alternative Designs/Layouts

The design approach for the proposed development is presented in the Architectural Design Statement prepared by the project Architects, Brian Connelly Associates, and it should be read in conjunction with this chapter of the EIAR.

Alternative site layouts and siting progressed throughout the design process in order to minimise the impact on the receiving environment at the earliest opportunity. The initial stage involved a constraints analysis of the land within the proposed development site to identify all high-level constraints and aggregate them against the site to allow a suitable layout to be developed. These constraints included the sites topography, the high-amenity zoned lands to the north and the River Liffey to the east.

Section 3 of the Architectural Design Statement prepared by the project Architects, Brian Connelly Associates, which outlines alternative layouts considered is included at Appendix 2.1.

2.5 "Do Nothing" Alternative

In the event of the 'do-nothing' scenario, the current use of the site is likely to continue, whereby the lands would remain in use for grazing along with the agricultural use of the site. A "do-nothing" scenario was considered to represent an inappropriate, unsustainable and inefficient use of these residential zoned lands. In addition, the additional demand / support for local infrastructure, services, and

businesses would not be generated by any new population on site; nor would local housing demand be catered for.

In terms of landscape and visual impact, the site would continue to have an agricultural character, with intermittent visibility and would continue to be well-screened by mature planting along the site boundaries where necessary.

2.6 Conclusion

Having examined various reasonable alternative designs, it is considered that the proposed design is a preferable option in terms of the sustainable development of the subject site insofar as it achieves 305 no. units and a net residential density of 37.62 no. units per hectare. The current design achieves a strong mix of housing types, sizes, and designs and the introduction of duplex units throughout the site has resolved the difficulty of achieving a critical mass of housing in this location whilst also providing adequate open space and achieving a strong urban edge and passive surveillance.

3.0 PLANNING AND DEVELOPMENT CONTEXT

3.1 Introduction

This section of the EIAR has been prepared by Hughes Planning and Development Consultants. More specifically, this chapter of the EIAR was prepared jointly by Mr. Kevin Hughes, Director, and Ms. Margaret Commane, Associate, with Hughes Planning and Development Consultants.

Mr. Kevin Hughes of Hughes Planning and Development Consultants, graduated from University College Dublin (UCD) with a Masters in Regional and Urban Planning (MRUP) in 2002, having previously completed a Bachelor of Arts Degree in Sociology from National University of Ireland in 1999. Kevin has over 18 years professional experience in the field of planning and development consultancy, which has included providing consultancy services in respect of several major urban regeneration projects including EIA. Kevin is currently the Director of Hughes Planning and Development Consultants.

Ms. Margaret Commane of Hughes Planning and Development Consultants, graduated from University College Cork (UCC) with a Masters in Planning and Sustainable Development (MPLAN) in 2012, having previously completed a Bachelor of Arts Degree in Geography and Legal Science from National University of Ireland in 2010. Margaret has over 7 years professional experience in the field of planning and development consultancy, which has included providing consultancy services in respect of several major urban regeneration projects including EIA. Margaret is currently an Associate in the Practice of Hughes Planning and Development Consultants.

It outlines the statutory planning context and the previous planning history for the subject site.

3.2 Statutory Planning Context

The subject lands are subject to national, regional and local objectives and planning policies. The following outlines the key planning documents of relevance to the future development of the subject lands. This section will not address the detailed policies and objectives contained in the various plans which are relevant to the proposed residential development at Clane, as these are addressed the Statement of Consistency and Planning Report, prepared by Hughes Planning and Development Consultants, which accompanies the planning application.

National

- Project Ireland 2040 – National Planning Framework (2018).
- National Development Plan 2018—2027.
- Urban Development and Building Heights - Guidelines for Planning Authorities, December 2018.
- Rebuilding Ireland – Action Plan for Housing and Homelessness, July 2016.
- Quality Housing for Sustainable Communities – Guidelines for Planning Authorities (2007).
- Sustainable Residential Development in Urban Areas – Guidelines for Planning Guidelines (2009).
- Urban Design Manual – A Best Practice Guide, 2009.
- Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities (2018).
- Design Manual for Urban Roads and Streets (2013).
- The Planning System and Flood Risk Management Guidelines for Planning Authorities (2009).
- Guidelines for Planning Authorities on Childcare Facilities (2001).
- Smarter Travel: A Sustainable Transport Future - A New Transport Policy for Ireland (2009).

Regional

- Regional Spatial & Economic Strategy for the Eastern and Midland Regional Assembly, June 2019.

County

- Kildare Development Plan 2017-2023.

Local

- Clane Local Area Plan 2017-2023.

The Clane LAP 2017-2023, as adopted on 6th June 2017, sets out the planning policy context for future development in Clane up until 2023. It details land use and development objectives, settlement hierarchy, development control standards and policies and objectives for the protection of the built and natural environment of the town is considered the most relevant document pertaining to the future development of the subject lands. According to the zoning objectives contained within the Kildare County Development Plan 2013-2019 the proposed development site is subject to 2 no. zoning objectives including 'C – New Residential', which covers the majority of the site, the objective of which is as follows:

'To provide for new residential development.'

The second zoning designation, which pertains to a smaller section of the application site, is 'F2 – Strategic Open Space', the objective of which is as follows:

'To preserve, provide for and improve recreational amenity, open space and green infrastructure networks.'

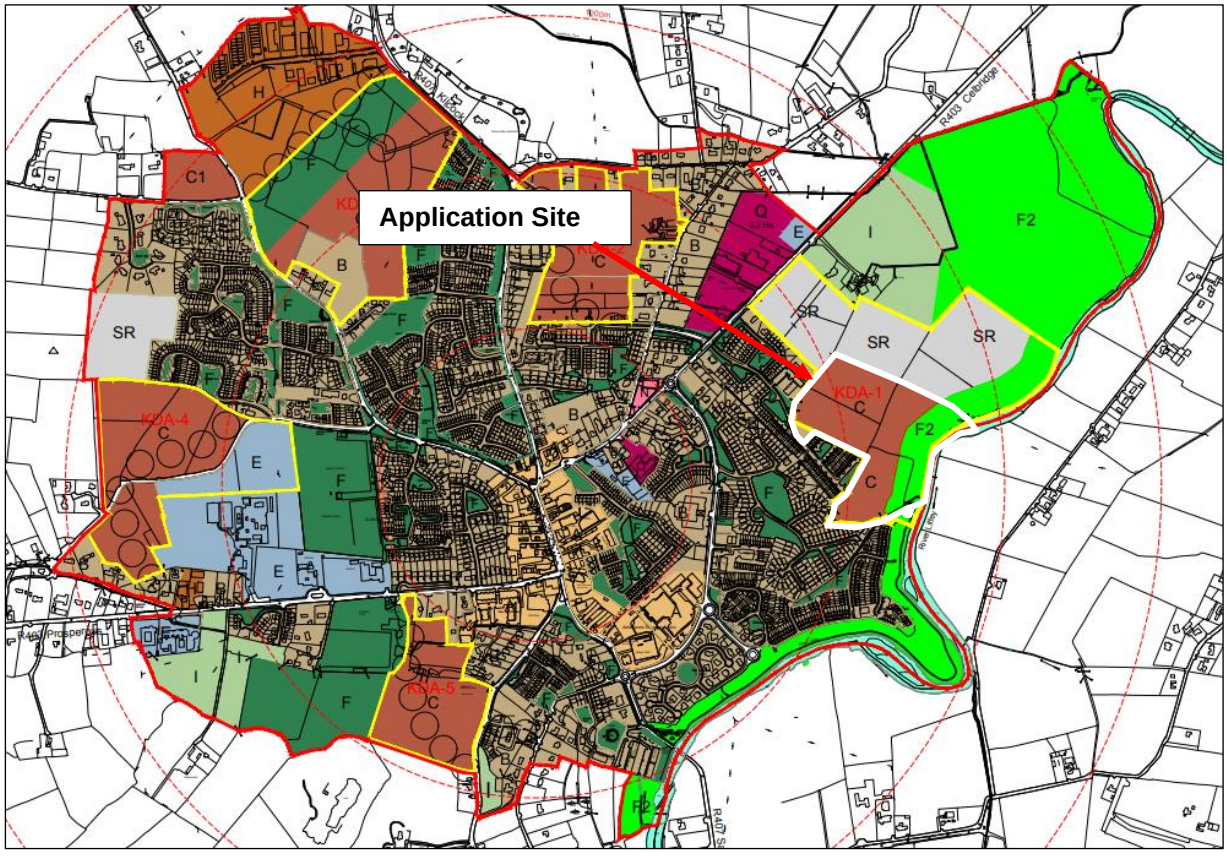

Figure 3.1 Extract from Land Use Zoning Objectives Map of the Clane Local Area Plan 2017 – 2023 illustrating the application site, white outline, within lands subject to the 'C – New Residential' zoning objective and designated as a Key Development Area (KDA1).

Further to the identified zoning objective, the site is also designated as a Key Development Area 1 (KDA1). The objective for KDA's is as follows:

'to ensure that best practice urban design principles are applied to all new development, based on the principle that well planned and integrated development enhances the sustainability, attractiveness and quality of an area'.

3.3 Planning History of the Site

A review of Kildare County Council's online planning register revealed no applications lodged in respect of the subject site as a whole. A review of the Kildare County Council's online planning register did reveal one application lodged in respect of part of the subject site (eastern most section), details of which are as follows:

Reg. Ref. 062674 Planning permission granted on 21st October 2008 for a 91 no. bedroom nursing and convalescing centre, 40 no. unit retirement complex and associated site works.

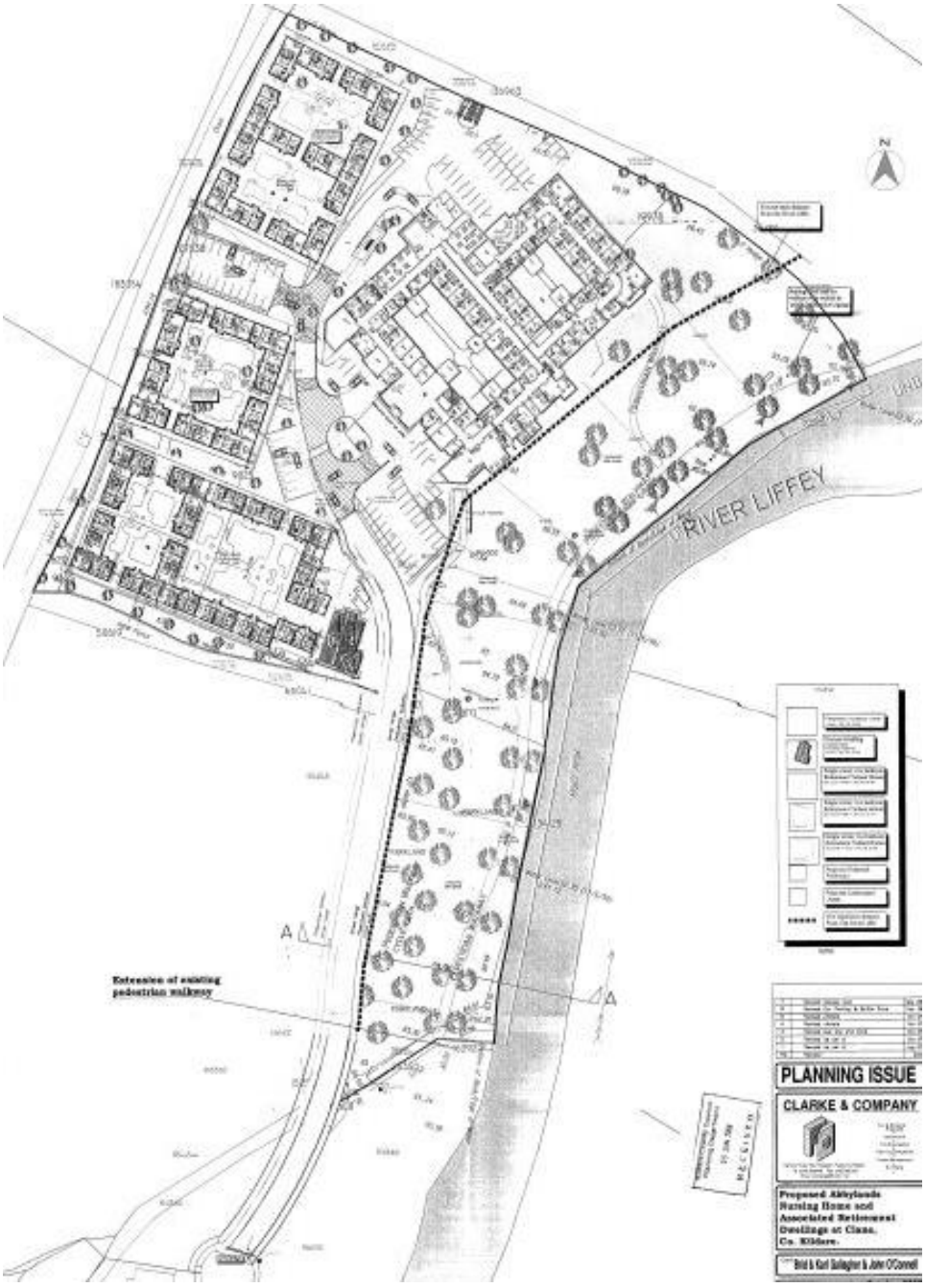

Figure 3.2 Site Layout Plan approved under Reg. Ref. 062674

The above development was appealed to An Bord Pleanala by a third party, under An Bord Pleanala Ref.: PL 09.231741, but this appeal was subsequently withdrawn.

This planning permission was extended (under Reg. Ref. 13/705) until 19th July 2019. The permission was not acted upon and has since expired.

4.0 POPULATION AND HEALTH

4.1 Introduction

This section of the EIAR has been prepared by Hughes Planning and Development Consultants. More specifically, this chapter of the EIAR was prepared jointly by Mr. Kevin Hughes, Director, and Ms. Margaret Commane, Associate with Hughes Planning and Development Consultants.

Mr. Kevin Hughes of Hughes Planning and Development Consultants, graduated from University College Dublin (UCD) with a Masters in Regional and Urban Planning (MRUP) in 2002, having previously completed a Bachelor of Arts Degree in Sociology from National University of Ireland in 1999. Kevin has over 18 years professional experience in the field of planning and development consultancy, which has included providing consultancy services in respect of several major urban regeneration projects including EIA. Kevin is currently the Director of Hughes Planning and Development Consultants.

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According to European Commission's Environmental Impact Assessment of Projects: Guidance on the Preparation of the Environmental Impact Assessment Report (2017), human health is:

> *'a very broad factor that would be highly project dependent. The notion of human health should be considered in the context of the other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study. In addition, these would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the Project and surrounding population.'*

This section of the EIAR assesses the impact of the proposed development on the human environment in the general area of the subject site at Clane, Co. Kildare, in terms of population levels, impact on employment, commercial activity, community infrastructure and social facilities.

This chapter addresses potential impacts of the proposed development of a residential scheme at Capdoo & Abbeylands, Clane, Co. Kildare, on population and human health. Potential impacts of this proposal on population and human health arising from traffic and transportation, air quality and climate, noise and vibration, visual amenity and material assets: utilities and the risk of major accidents and/or disasters are dealt with in the specific chapters in this EIAR dedicated to those topics.

4.2 Methodology

At the time of writing there is no guidance from the EU Commission on the 2014 EIA Directive to indicate how the new term 'Human Health' should be addressed. Therefore, this chapter of the EIAR document has been prepared with reference to recent national publications which provide guidance on the 2014 EIA Directive including Draft Guidelines on the information to be contained in environmental impact assessment reports, published by the EPA in August 2017.

To establish the existing receiving environment / baseline, several site visits were undertaken to appraise the location and likely and significant potential impact upon human receptors. Further to this, a desk top study of a number of relevant policy documents and data sources was carried out, including: Central Statistics Office Census data; the ESRI Quarterly Economic Commentary; the Regional Spatial

and Economic Strategy for the Eastern and Midlands Regional Assembly; the Kildare County Development Plan 2017-2023 and the Clane Local Area Plan 2017-2023.

4.3 Population

4.3.1 Receiving Environment (Baseline Scenario)

On the ground, population to the north and east of the site is minimal due to the rural nature of the landscape and the quality of agricultural lands in this area. To the west and south of the site, residential development has extended from the centre of the town as a result of Clane's historical growth over time. The subject site at Capdoo is located within the Electoral Division of Clane (Electoral Division No. 06062), which, according to the Census had a population of 8,142 no. persons in 2016. This represents a population percentage change of 7.6% or an actual population increase of 615 no. people from the 2011 Census figures.

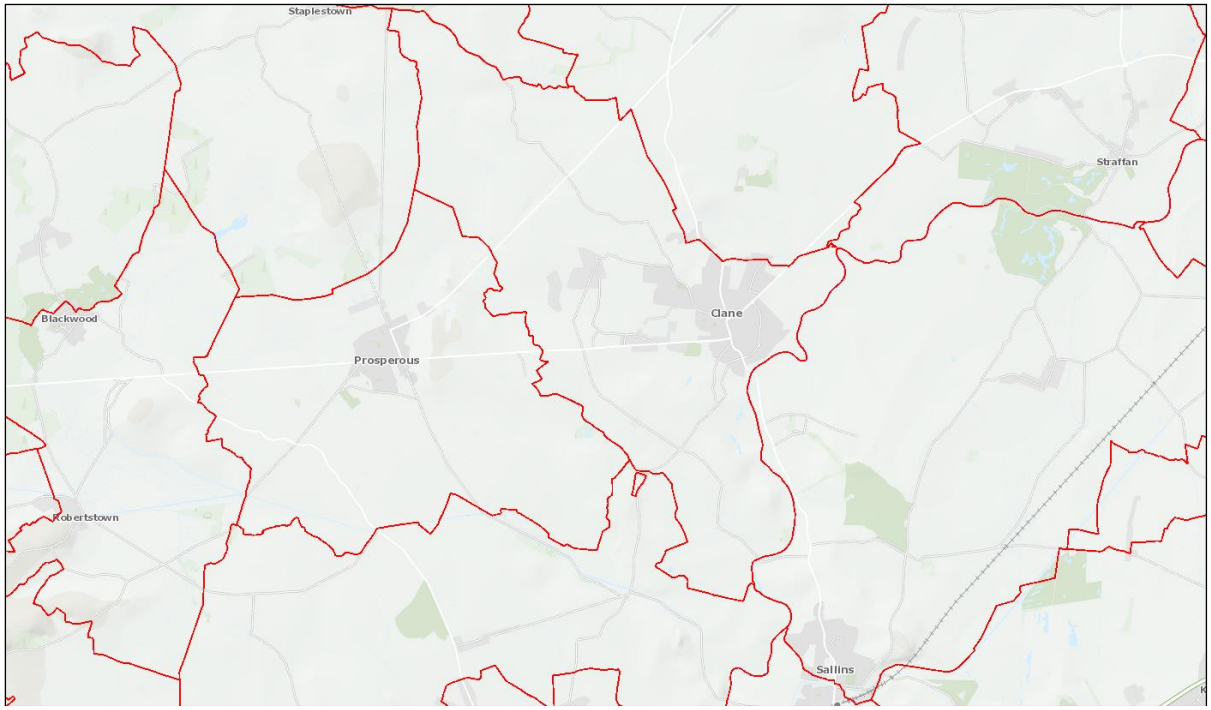

Figure 4.1 Aerial image of the subject site, outlined in green, with the electoral division of Clane

Population characteristics for the broader Clane area have been obtained from the Central Statistics Office Census of Population (CSO). Table 4.1, below, shows the population growth within the applicable small area, Co. Kildare, the settlement of Clane and Ireland as a whole, illustrating that the population in the vicinity of the proposed development has increased over recent inter-censal periods. The subject electoral division (Clane) has experienced considerable growth over the 10 no. year between 2006 and 2016 with the percentage change in this Town 228% greater than that experienced by the State.

Settlement/Province	2006	2011	2016	% Change		
				2006-11	2011-16	2006-16
Ireland - State	**4,239,848**	**4,588,252**	**4,761,865**	**7.6**	**3.65**	**11.0**
Co. Kildare	**186,355**	**210,312**	**222,504**	**11.4**	**5.5**	**16.3**
Clane	**6,106**	**7,527**	**8,142**	**18.9**	**7.6**	**25.1**

Table 4.1 Population Trends 2006-2016 in Clane, Co. Kildare & the State.

The above table identifies the significant population growth that the settlement of Clane has experienced in comparison to Ireland and the wider County of Kildare. The CSO data outlines that whilst Ireland has seen an 11% increase in population from 2006 to 2016, whilst during the same period, Drogheda has

experienced a 25.1% growth. The population within the settlement of Clane has increased and is projected to continue to increase due to its proximity to Dublin City Centre and a number of employment centres within Kildare, including Naas and Celbridge

With regards to population profile, the populations of the settlement of Clane appears to contrast with the State average with regards to comparative figures for elderly and young people. Approximately 30.5% of the population within Clane is under 18 years of age, compared to 26.2% of the state population. It is also noted that 7.8% of the Clane population are over the age of 65 years in comparison to over 13.3% of the State population. The Dependency Ratio within Clane (i.e. those not in the workforce – aged 0-18 and over 65) can therefore be said to be approximately 38.3% and is thus lower than that of the State, the figure for which is 39.5%.

Age Cohort	Population/Percentage in each Age Cohort - 2016		
	State	Co. Kildare	Settlement of Clane
All Ages	4,761,865	222,504	8,142
0-4	331,515 /6.9%	17,314 / 7.8%	733 / 9%
5-12	548,693 /11.5%	29,453 / 13.2%	1,060 / 13%
13-18	371,588 /7.8%	19,188 / 8.6%	698 / 8.5%
19-24	331,208 /6.9%	15,562 / 7%	499 / 6.1%
25-44	1,406,291 /29.5%	67,391 / 30.2%	2,694 / 33%
45-64	1,135,003 /23.8%	51,582 / 23.2%	1,823 / 22.4%
65-69	211,236 /4.4%	8,333 / 3.7%	241 / 3%
70+	426,331 /8.9%	13,681 / 6.1%	394 / 4.8%

Table 4.2 Population Profile 2016 in Clane, Co. Kildare & the State.

4.3.2 Potential Impact of the Proposed Development

'Do Nothing' Scenario

Were the development to not proceed, the present agricultural use of the subject site would remain. The majority of the subject site has been zoned for residential development. As such, a 'do nothing' scenario would mean that this objective of the Development Plan would not be met, and some 305 no. households would remain uncatered for.

As such, the impact of the development not proceeding on population profile and trends in the area would be negative.

Construction Phase

The construction phase of the proposed development should not have any direct impact on the population of the area as no additional persons will be housed on site.

The construction phase will generate a greater number of people within the area on a temporary basis, as the construction will see construction workers and delivery drivers arriving and leaving the site at the start and end of each day. However, the implications of this are not considered to have significant effects to the surrounding community due to the location of the site on the outskirts of the built up area of Clane.

Operational Phase

The provision of up to 112 no. houses and 193 no. apartments/maisonette/duplex units within the application site will have a significant and permanent positive impact on the population of Clane, contributing to the settlement's growth in a compact manner. With a total of 305 no. residential units proposed to be built, the anticipated increase in population for the site can be expected to be c. 830 no. This is based on average household numbers for two, three and four bedroom residential units. The impacts of an increase in the population within the site will be gradual given the development will be completed in phases. The population of the development will not significantly impact the surrounding area due to the existing boundary treatments of the R403 road to the west and existing agricultural land

located to the north and east of the development site. The new community resulting on the subject site is considered significant and positive, particularly in the context of current housing demand.

4.4 Employment and Economic Activity

4.4.1 Receiving Environment (Baseline Scenario)

The CSO's quarterly Labour Force Survey (Q4 for 2018) indicated an annual increase of 2.3% (50,500) in employment at national level, bringing total employment to 2,281,300. This compares with an annual increase of 3.1% or 66,800 in the year to Q4 2017, 3.0% or 66,700 in employment in the previous quarter and an increase of 3.8% or 79,200 in the year to Q4 2016.

Unemployment steadily declined by 10.5% (15,200) for the 2018 Q4, bring the total unemployment number to 128,800 people. The growth in employment is compounded by the 2019 Q1 statistics which indicate that the number of unemployed people has continued to fall to a total of 114,400, with the total figure for employed people rising to 2,301,900. This is a significant statistic, given this is the twenty seventh quarter in succession where unemployment has declined on an annual basis.

The total number of persons in the labour force for 2019 Q1, represents an increase of 0.9% over the 2018 Q4. Moreover, 12 of the 14 economic sectors reported an increase in employment numbers. The largest of these were recorded in the Transportation and storage (+11.4% or +10,800) and the Administrative and support service activities (+10.6% or 10,500) sectors.

The above sources demonstrate that the national economy and employment levels are expected to improve in 2019 and beyond, with the Government faced with the challenge of sustaining economic activity and competitiveness during a period of likely full employment. This in turn results in increased demand for residential dwellings particularly within the Dublin region, including Meath, Louth, Kildare and Wicklow.

4.4.2 Potential Impact of the Proposed Development

'Do Nothing' Scenario

Were the current agricultural land use to continue on the subject site, the current levels of employment required to maintain this activity would remain steady and the subsequent impact on employment would be neutral.

In a 'do nothing' scenario, the economic investment arising from a large-scale construction project would not be availed of, and this strategically located, zoned site would remain in use for farming and grazing. This would represent a lost opportunity in economic terms.

Construction Phase

The construction phase of the proposed development will likely provide a positive improvement to the economy and employment prospects within Clane and the surrounding area more broadly.

The construction of 305 no. residential dwellings will provide a substantial level of construction-related employment for the duration of the development. Whilst it is difficult to place a total number on the employment for the proposed development, the extent of work and varying construction related industries required for the residential development will provide a variety of employment phased over the course of the development.

The construction phase will also have secondary and indirect 'spin-off' impacts on ancillary support services in the area of the site, such as retail services, together with wider benefits in the aggregate extraction (quarry) sector, building supply services, professional and technical professions etc. These beneficial impacts on economic activity will be largely temporary but will contribute to the overall future viability of the construction sector and related services and professions over the phased construction period.

Whilst there will be some negative impacts felt to the wider community during the construction phase by way of noise, dust and traffic, this is unlikely to be significant. These issues and appropriate mitigation measures are addressed in Chapters 8, 9 and 10 of the EIAR, in the Preliminary Construction Management Plan and Construction Waste Management Plan which accompany the application. The Preliminary Construction Management Plan outlines that a Construction Traffic Management Plan be implemented for the site which will minimise disruption to the surrounding road network.

Operational Phase

The operational phase of the proposed development will result in the provision of 305 no. residential units with associated private amenity space. This will provide accommodation for up to 1526 people, based on 13 no. of 1 bedroom units, 165 no. of 2 bedroom units, 83 no. of 3 bedroom units and 44 no. of 4 bedroom units.

This increase in population in the area will enhance local spending power and will assist with the delivery of a critical mass of population which will support a wide range of additional local businesses, services, transport infrastructure and employment opportunities. This will play a role in the future growth of Clane and the improvement of local amenities and infrastructure.

4.5 Land Use and Settlement Patterns

4.5.1 Receiving Environment (Baseline Scenario)

The subject site is currently a greenfield site that has been earmarked for future residential development based on its location within a Key Development Area (KDA 1). The subject site is located on the north-eastern edge of Clane Town within close proximity to existing residential developments at Brooklands and Alexander Walk to the immediate south. The lands surrounding the subject site to the north and east are predominantly greenfield in nature and under agricultural use. The sites western boundary is situated within close proximity to the R403, being separated via existing agricultural and residential lands. The eastern boundary of the site is flanked by the River Liffey whilst the site is adjoined by agricultural fields to the north.

It is noted that the site is to be provided with 2 no. new links to the existing road network via existing access roads to the aforementioned residential estates, Brooklands to the south-west and Alexandra Walk to the south-east. Whilst the subject site and immediately adjoining lands (located east of the R403) have predominantly operated as agricultural land, present zoning reflects changing land use patterns for this area, within the north-eastern environs of Clane Town. The zoning of the land, as a Key Development Area (KDA) provides an opportunity for Clane to increase its population and status as a growing urban centre within Co. Kildare.

As Figure 4.2 overleaf outlines, the part of the subject site is zoned ‘C – New Residential’ and is subject to the following objective with regards to its future development:

> *‘To provide for new residential development.’*

Further to the identified zoning objective, the site is also designated as a Key Development Area 1 (KDA1). The objective for KDA’s is as follows:

> *‘to ensure that best practice urban design principles are applied to all new development, based on the principle that well planned and integrated development enhances the sustainability, attractiveness and quality of an area’.*

It is considered that both the zoning objective and development status of the application site have been set to ensure the consolidation of Clane Town. It is apparent, following a review of the zoning map, that the purpose of the KDAs is to prevent urban sprawl from resulting in unbalanced growth outwards from the centre of Clane whilst, at the same time, ensuring that new development is adequately serviced by amenity spaces.

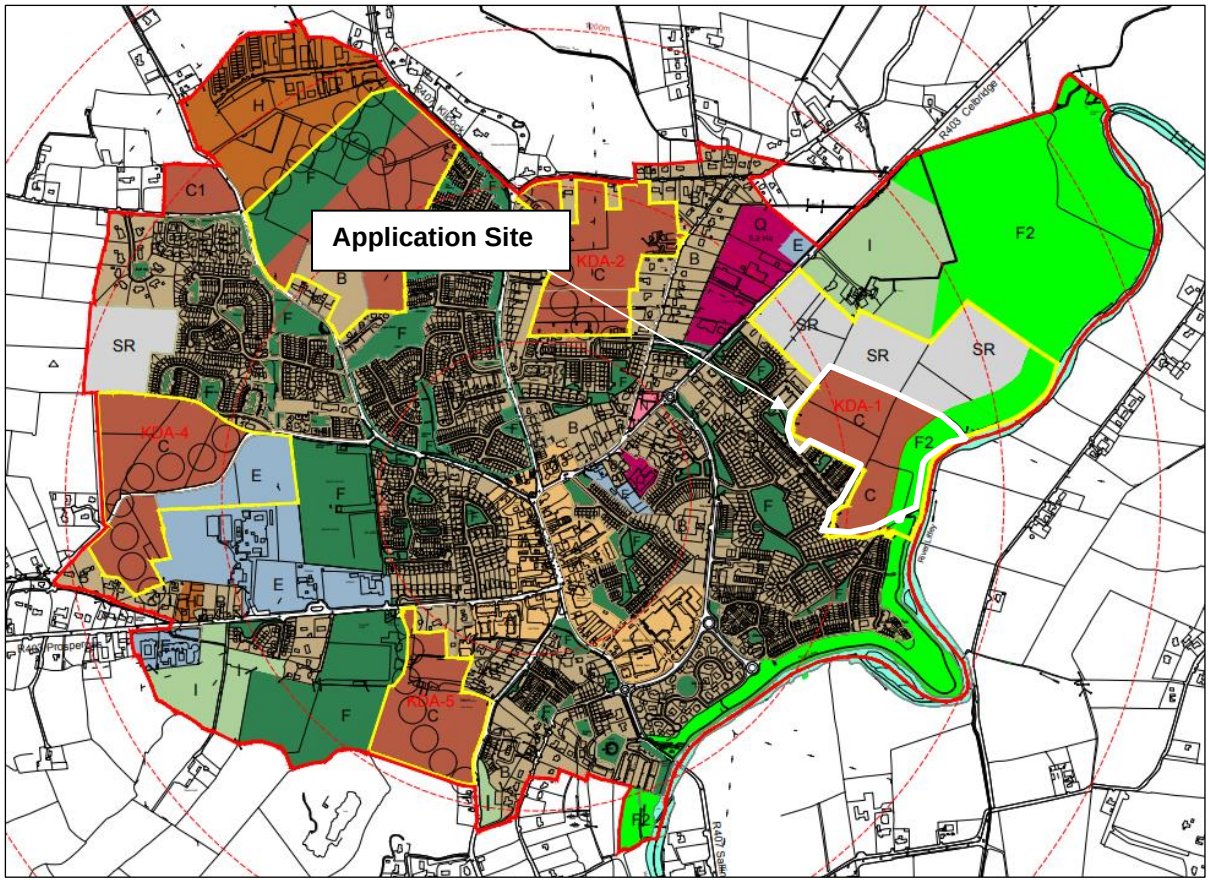

Figure 4.2 Extract from Land Use Zoning Objectives Map of the Clane Local Area Plan 2017 – 2023 illustrating the application site, white outline, within lands subject to the 'C – New Residential' zoning objective and designated as a Key Development Area (KDA1).

Clane has been identified in the Kildare County Development Plan 2017-2023 as a 'Small Town', and as such, specific policies and objectives relating to the growth of population and economic development of the town have been identified. The Development Plan includes the following policy:

> *'Small Towns within the Hinterland area generally comprise populations of between 1,500 – 5,000. Their role is to develop as key local centres for services with levels of growth to cater for local need at an appropriate scale and to support local enterprise to cater for local demand. The rate of growth will be controlled to limit pressure on services, the environment and unsustainable commuting patterns. Small Town Plans have been prepared to provide a planning framework for their future development and are detailed in Volume 2, Section 1.*

Notwithstanding the findings of Census 2016 which place the population of Clane at over 8,000 residents, thus far in excess of the 1,500-5,000 figure presented for 'Small Towns', it is considered that the proposed development is in keeping with the policies and objectives for the township of Clane and is consistent with the identified land uses applied to the site, and appropriately responds to the existing settlement pattern and residential densities of nearby developments.

4.5.2 Potential impact of the Proposed Development

'Do Nothing' Scenario

Were the development to not proceed, the present agricultural use of the subject site would remain. As discussed in Section 4.3.2 above, a do-nothing scenario would mean that the objectives of the Development Plan would not be met, and some 305 no. households would remain uncatered for.

Construction Phase

The construction phase of the development will see site works comprising site clearing, excavation, infrastructure works in preparing the road and drainage infrastructure and construction works. It has the potential to impact adversely and result in the temporary degradation of the local visual environment on a short-term basis. Construction works are likely to take place on a phased basis, which will moderate the potential impacts on adjoining land use. The Preliminary Construction Management Plan, prepared by FM Safety, addresses these issues in more detail. As the development is on greenfield land, there is no proposed demolition and will therefore not cause any significant disturbance to the adjoining properties given the nature of the work and the generous setbacks to adjoining development.

There will be an increase in population on the site during construction as a result of the proposed development. Given the location and size of the subject site, the rise of employment numbers on-site is not considered to negatively impact the surrounding community. There may be some increase in traffic on Clonard Road from the north and south to access the site, however, this is considered to be within reason, and will be managed in accordance with the Traffic Management Plan which will be prepared and agreed with Kildare County Council prior to construction commencing.

Operational Phase

The operational phase will see former farming land transformed into a residential land use which in keeping with planning policy, helps address the growing population and housing shortage across Ireland and Kildare in particular. The development will include 3.15 hectares of land for public open space to be utilised by the surrounding community. A significant portion of the public open space will comprise a large park situated on the western bank of the River Liffey with a new public walkway provided for the benefit of both the local community and associated placemaking effects.

4.6 Housing

4.6.1 Receiving Environment (Baseline Scenario)

Housing completions across the country plummeted after the recession occurred in 2007/2008 with completions declining from almost 90,000 no. per year in 2007 to approximately 11,000 no. in 2014. In light of this, the Government published the 'Rebuilding Ireland - Action Plan for Housing and Homelessness' policy document which includes the following central objective:

> *'To double the completion level of additional homes in the next four years to deliver the 25,000 homes or more required annually.'*

According to the CSO New Dwelling Completions Report, 18,072 no. new dwellings were completed in 2018. This is c. 27.5% below the target set in the 'Rebuilding Ireland - Action Plan for Housing and Homelessness' policy document.

> *'The National Planning Framework - Ireland 2040 requires delivery of a baseline of 25,000 homes annually to 2020, followed by a likely level of 30-35,000 annually up to 2027. Within this output 112,000 households are expected to have their housing needs met in a social housing home over the next decade. To achieve the objective of compact growth, 40% of future housing delivery is to be delivered within and close to the existing footprint of built-up areas.'*

The Kildare Development Plan 2017-2023 identifies Clane as a 'Small Town' whilst we note the following commentary from the Eastern & Midland Regional Assembly Regional Spatial & Economic Strategy

> *'Towns recording the highest growth rates in the country over the last ten years (>32%), and which have lower levels of employment provision include; Ashbourne, Balbriggan, Blessington, **Clane**, Kinsealy-Drinan, Lusk, Laytown-Bettystown, Ratoath, and Sallins. Nevertheless, it should also be noted that such towns are important employment and service centres. In addition, some of these settlements, such as Ashbourne and Ratoath have the potential to strengthen their employment base and develop as important centres*

of employment due to their strategic location, connectivity with surrounding settlements, and the availability of a skilled workforce.'

It is considered that the location of Clane is attractive for prospective developers given its proximate distance to Dublin City Centre. Moreover, we note additional employment hubs within local urban centres at Leixlip, Celbridge and Naas which can serve the expanding population of this town.

The strategic vision for Clane, as per the Clane LAP 2017-2023 is as follows:

'To promote the sustainable growth of Clane, building on its established character and supporting its role as a small town and a local services centre. In this context, the plan will provide for growth to cater for local need; will support economic development and job creation based on local strengths; will promote sustainable movement and identify opportunities to enhance connectivity within the built environment; will identify opportunities for the delivery of supporting infrastructure, facilities and amenities to support the growing community and will seek to protect and enhance built and natural heritage and the environment.'

It is considered that the proposed residential housing development is compliant with the strategic vision for the future development of the town. The development will provide additional housing and a new public park on appropriately zoned lands to ensure the consolidation and managed growth of this urban centre.

4.6.2 Potential impact of the Proposed Development

'Do Nothing' Scenario

There are currently no persons residing on the subject lands. The site is in a greenfield state and is used for grazing associated with the existing farm use on site. Were the development not to proceed, this scenario would continue and the site would remain in its current use.

The impact of a 'do nothing' scenario would be negative in terms of housing in the Clane area as the subject site would fail to realise the development potential afforded by its residential zoning.

Construction Phase

As discussed in Section 4.3.2 previously, the construction phase of the proposed development will see no additional persons housed on site.

Operational Phase

The proposed development will result in the addition of 305 no. units to the supply of housing in the Clane area. These will be a mixture of 2, 3 and 4 bedroom residential units.

The addition of these proposed units will contribute to the housing unit target, 305 no. units over the plan period, outlined for Clane within the Clane Local Area Plan 2017-2023.

4.7 Community Infrastructure and Social Facilities

4.7.1 Receiving Environment (Baseline Scenario)

The Clane Local Area Plan 2017-2023 identifies '*a wide variety of community facilities, services and groups spread throughout the town which provide a supporting network to the residential population.'*

The subject site is located in the north-eastern corner of Clane whilst the proposed residential units are contained within the north, west and south of the site allowing for a large buffer zone (public park) to be provided along the site's boundary with the River Liffey. The existing local population is contained along the southern and western boundaries of the application site. It is noted that there are a number of recreational and sporting facilities within proximity to the site including:

- Clane GAA 1.6km south-west of application site;
- Clane United A.F.C. 1.5km south-west of application site;
- Clane Rugby FC 1.5km south-west of application site;
- Clane Boxing Club 2.3km north-west of application site;
- Clane Tennis Club 700m south-west of application site;
- Breathing Place Yoga 900m south-west of application site;
- The Abbey Community Centre 1.2km south-west of application site; and
- The Woods Centre Library 1km south-west of application site.

Clane Town is also served by educational facilities as follows:

- Scoil Bhríde Girls' National School 1km south-west of application site (468 pupils);
- Scoil Phádraig Boys' National School 1.8km south-west of application site (494 pupils);
- Scoil Mhuire Community School 2km south-west of application site (1,099 pupils); and
- Hewetson School 2.6km south-west of application site (86 pupils).

Further services, inclusive of childcare, healthcare, religious and community facilities are provided within Clane with the town also serviced by a number of passive recreation facilities including public houses, restaurants, cinemas public parks.

4.7.2 Potential impact of the Proposed Development

'Do Nothing' Scenario

There are no social services currently located on the subject site, therefore there would be a neutral impact in a 'do nothing' scenario.

Construction Phase

The construction of the proposed development will unlikely have any significant implications to the existing community infrastructure and social facilities. The immediate effects of the construction phase will be centred around the subject site. The construction phase will have some impacts on the surrounding environment through noise and increased traffic. There are however no foreseeable short-term construction impacts that will impact negatively on the community infrastructure or social facilities.

Operational Phase

The population growth that will occur as a result of the proposed development will provide a positive impact to the Clane environs and will contribute to the existing social and community infrastructure. The new residents of the development would likely lead to increased funding and patronage of existing services and facilities. The overall size of the development and population growth will not be of vast proportions that the existing community and social infrastructure cannot cope with the demand. In addition, the critical mass generated by the proposal would likely create demand for new facilities and services, which would indirectly benefit the wider area.

The inclusion of a landscaped public open space, including cycle and pedestrian paths, east of the application site significantly impact the social amenities of the town in a positive manner. It will enable more residents and visitors to gain access to the high-quality open space, improving residents' ability to lead a healthy lifestyle. This will be a significant positive impact of existing and future residents.

4.8 Health and Safety

4.8.1 Receiving Environment (Baseline Scenario)

The subject site is situated west of the River Liffey and east of the R403. The site is comprised of greenfield land used for agriculture whilst being bound to the south/west by established residential estates. The site is not on any former industrial land and has not been contaminated from any former industrial uses, therefore the site is not considered to pose any significant health or safety risk.

4.8.2 Potential impact of the Proposed Development

'Do Nothing' Scenario

The site is in a greenfield state and is used for grazing associated with farming facilities in the wider area. Were the development not to proceed, this scenario would continue and the site would remain in its current use with only health and safety risks associated with the lands agricultural use to contend with.

Construction Phase

As with all construction, there will be inherent health and safety risks at this stage of the development. The construction of the proposed development will give rise to a number of short-term impacts regarding include noise, dust and an increase in traffic flow arising from site workers, deliveries etc. These items are dealt with separately in the relevant chapters of this EIAR. The construction of the proposed development will be done so in accordance with the Preliminary Construction Management Plan and a Traffic Management Plan (to be prepared and agreed with Kildare County Council prior to commencement) which will ensure that the works do not pose an adverse risk to the health and safety of both the surrounding properties/community and the workers on-site.

Operational Phase

Similarly, the operation of the proposed development is unlikely to create any significant health or safety risks to residents of the development, or adjoining the site. The proposed development has been designed to provide for a safe environment for future residents and visitors alike. The design and layout of the proposed development has been designed in such a way to ensure that footpaths are well lit and passive surveillance occurs. The paths, roadways and public areas have all been designed in accordance with best practice and the applicable guidelines. Likewise, the proposed residential units and childcare facility accord with the relevant guidelines and will meet all relevant safety and building standards and regulations, ensuring a development which promotes a high standard of health and safety for all occupants and visitors.

4.9 Risk of Major Accidents and Disasters

The 2018 EIA Guidelines state that an EIAR must include the expected effects arising from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project.

Given the nature of the proposed development, there is one key factor that could contribute to a 'major accident or disaster' occurring on the subject site - potential flooding.

4.9.1 Receiving Environment (Baseline Scenario)

With regards to potential flooding, the primary potential flood risk to the proposed development site can be attributed to an extreme fluvial flood event in the River Liffey. The proposed development site is not at risk from pluvial or groundwater flooding

The OPW Preliminary Flood Risk Assessment Flood Map Number 2019/MAP/236/A (an extract of which is presented in Figure 4.3 overleaf) illustrates indicative flood zones within this area of County Kildare including in proximity to the subject site. The Eastern Region Catchment Flood Risk & Management Study (Eastern Region CFRAMS), issued in June 2016, estimates extreme flood water levels and a detailed DTM, constructed using topographical survey data of the existing site, the 1 in 100 year and 1 in 100 year plus climate change flood extents were delineated. OPW CFRAMS predictive flood map number E09LA_EXFCD_F1_10 (an extract of which is presented in Figure 4.4 overleaf) illustrates predictive extreme fluvial flood extent zones associated with the River Liffey in the vicinity of the proposed development site.

Upon review of these and other sources, it was deemed necessary to undertake a more accurate site specific delineation of the predictive 1% AEP and 0.1% AEP fluvial flood extents at the location of the proposed development site.

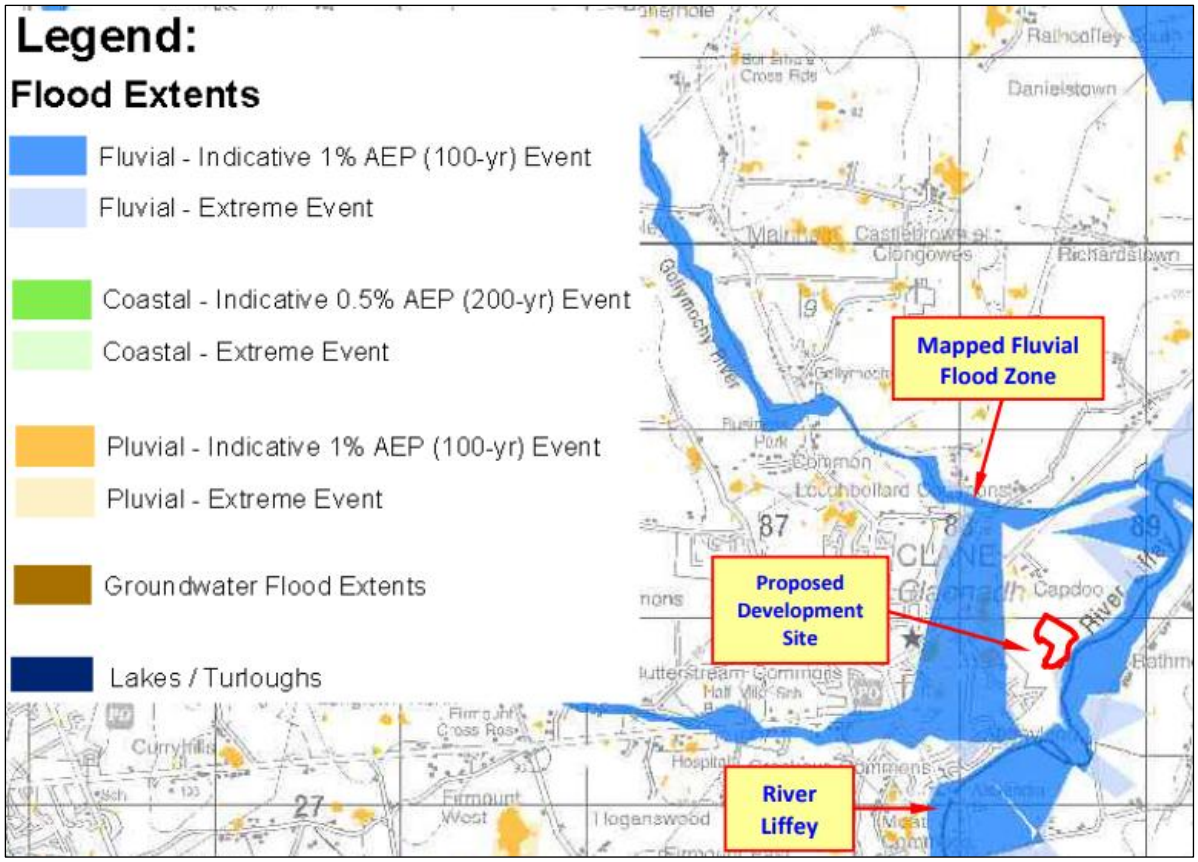

Figure 4.3 Excerpt taken from OPW Preliminary Flood Risk Assessment Flood Map No. 2019/MAP/236/A

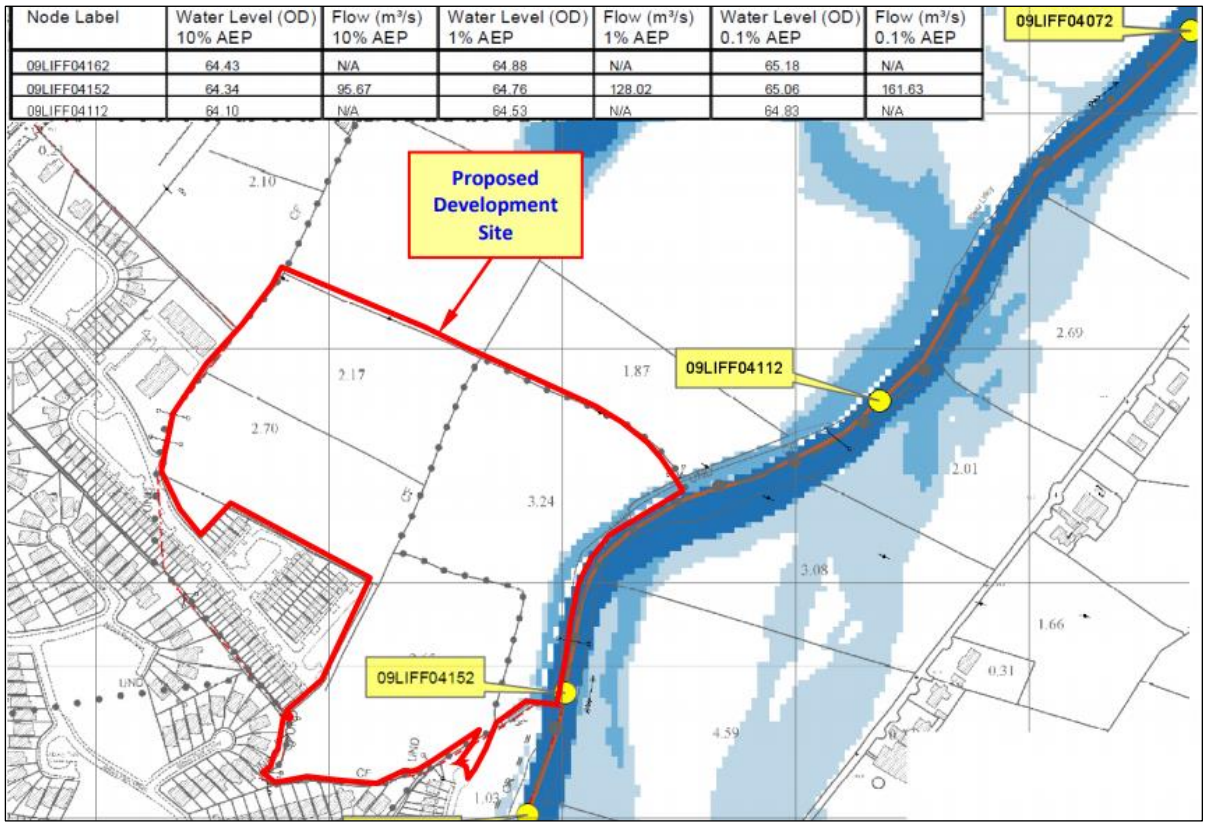

Figure 4.4 Excerpt taken from OPW CFRAMS predictive flood map No. E09LA_EXFCD_F1_10

For further information with regarding the matter of flooding, please refer to the Flood Risk Assessment, prepared by IE Consulting, included at Appendix 4.1.

4.9.1 Potential Impact of the Proposed Development

'Do Nothing' Scenario

Were the development not to proceed, the subject site would be the subject of occasional flooding – more specifically, 1 in 100 year (1% AEP) and 1 in 1000 year (0.1% AEP) extreme flood events for the River Liffey. However, this flooding would be limited to the part of the site immediately abutting the River Liffey.

Construction Phase

The construction of the proposed development will be done in accordance with a Construction Management Plan (based on the Preliminary Construction Management Plan submitted with this application) to manage the day to day proceedings, and to ensure that the movement of water and dust from the site do not create an unsafe environment. A number of temporary cut off trenches along the eastern development boundary introduced in advance of stripping topsoil will restrict the flow of water across the site and towards the River Liffey.

Operational Phase

The operation of the residential development similarly will not negatively impact the surrounding population or increase the likelihood of a major accident or disaster.

The part of the site proposed for development sits well above the River Liffey with no works proposed within a delineated flood zone.

The design of the development provides the primary site entrance in the north-western corner of the site, which is outside a delineated flood zone. The scheme has also been designed to mitigate potential flooding with the following mitigation measures have been incorporated into the proposed scheme, as per the recommendation of the Site Specific Flood Risk Assessment, prepared by IE Consulting:

- The finished ground levels (road levels, etc) are to be constructed to a minimum level of 0.15m above the maximum predicted 0.1% AEP flood level – i.e. 65.18m + 0.15m = 65.33m OD;
- The finished floor levels are to be constructed to a minimum level of 0.30m above the maximum predicted 0.1% AEP flood level – i.e. 65.18m + 0.30m = 65.48m OD; and
- The proposed development incorporates an appropriately designed stormwater management system that limits stormwater runoff from the site to existing pre-development runoff rates.

It is therefore considered that the operation of the site will not increase the risk to residents of any major accidents or disasters due to the surround environment.

4.10 Cumulative Impacts

The cumulative effects of the development on the surrounding population and human health have taken into consideration the existing surrounding environment, and in particular the established developed lands located west of the application site, and the lands surrounding Clane town.

The development of the site will likely have a positive cumulative impact on Clane in helping the town to achieve the number of housing units which are intended to be constructed over the lifespan of the Clane Local Area Plan 2017-2023. The economy will benefit both during the construction phase and operation phase increasing the economic activity within the town. The site is well connected with access into Clane via R403 Road, and is within proximate distance of the N7 Motorway.

There are not considered of be any significant adverse cumulative impacts to the population and human health either during construction or operation phase of the Clane residential development.

4.11 Mitigation Measures

Construction Phase

All standard health and safety procedures will be implemented at every stage of this project. The Main Contractor for the project is responsible for the method in which the demolition and construction works are carried out and to ensure that best practices and all legal obligations including Local Authority requirements and Health and Safety legislation are complied with. Further to this, Building Regulations will also be adhered to during the construction phase.

A range of construction related remedial and mitigation measures are proposed throughout this EIAR document with reference to the various environmental topics discussed under each. These measures seek to ensure that any likely significant adverse environmental impact on humans during the construction phases are either ameliorated to have an acceptable level of impact or avoided altogether. Included in these measures is the requirement that a detailed construction traffic management plan be prepared by the Contractor and agreed with Kildare County Council as the Road Authority prior to commencing works on the public road. This Construction Traffic Management Plan will include restrictions on deliveries and access to the construction site, typically both will be via Brooklands Housing Estate Road to avoid use of the local Road serving Alexandra Walk. Further, measures with regards to noise and dust abatement covered elsewhere within this EIAR will be implemented during construction and will limit impacts on population and human health.

Further to the above, working hours on site will be as such that the residential amenity of adjacent residences is not unreasonably impacted upon. They will be agreed with the Council in full as part of the required construction management plan.

As a result of the implementation of the abovementioned measures, the impacts of the construction phase of the development on population and human health are not anticipated to be significant. Furthermore, all impacts will be temporary in nature.

Operational Phase

The mitigation measures relating to the operation phase of the development concerning traffic, transport, noise, vibration, water, air and dust quality and landscaping as set out in this EIAR (and listed in Chapter 14.0) will be carried out in full to minimise impacts on residents of the development, adjacent residents and human health.

With regards to potential flooding, the following mitigation measures have been incorporated into the proposed scheme, as per the recommendation of the Site Specific Flood Risk Assessment, prepared by IE Consulting:

- The finished ground levels (road levels, etc) are to be constructed to a minimum level of 0.15m above the maximum predicted 0.1% AEP flood level – i.e. 65.18m + 0.15m = 65.33m OD;
- The finished floor levels are to be constructed to a minimum level of 0.30m above the maximum predicted 0.1% AEP flood level – i.e. 65.18m + 0.30m = 65.48m OD; and
- The proposed development incorporates an appropriately designed stormwater management system that limits stormwater runoff from the site to existing pre-development runoff rates.

4.12 Monitoring

There is no other ongoing monitoring required in relation to the effect of the proposed development on the population and human health.

5.0 BIODIVERSITY

5.1 Introduction

This report has been prepared by Padraic Fogarty of OPENFIELD Ecological Services. Pádraic Fogarty has worked for over 20 years in the environmental field and in 2007 was awarded an MSc from Sligo Institute of Technology for research into Ecological Impact Assessment (EcIA) in Ireland. OPENFIELD is a full member of the Institute of Environmental Management and Assessment (IEMA). This report provides for an assessment of the potential impacts to biodiversity of the proposed development.

Article 3 of the EIA Directive requires that "The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:… (b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;"

And

Annex IV point 4 of the EIA Directive requires "A description of the factors specified in Article 3(1) likely to be significantly affected by the project: … biodiversity (for example fauna and flora) …

Under Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora).a screening for 'appropriate assessment' of projects must be carried by the competent authority to assess, in view of best scientific knowledge, if that proposed development, individually or in combination with another plan or project is likely to have a significant effect on the European site. A full AA is required if it cannot be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site. The Habitats Directive has been transposed into Irish law by European Communities (Birds and Natural Habitats) Regulations 2011 – 2015.This assessment is carried out by the competent authority, in this case An Bord Pleanála. The AA Screening report is presented separately.

5.2 Study Methodology

The assessment was carried out in accordance with the following best practice methodology: draft 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports (Environmental Protection Agency, 2017) and 'Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland' by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018).

Site visits were carried out on the 2nd of August 2018 and the 21st of March 2019 in fair weather. The site was surveyed in accordance with the Heritage Council's Best Practice Guidance for Habitat Survey and Mapping (Smith et al., 2011). Habitats were identified in accordance with Fossitt's Guide to Habitats in Ireland (Fossitt, 2000). The nomenclature for vascular plants is taken from The New Flora of the British Isles (Stace, 2010) and for mosses and liverworts A Checklist and Census Catalogue of British and Irish Bryophytes (Hill et al., 2008).

August lies within the optimal survey period for general habitat surveys (Smith et al., 2010) and so a full description of habitats has been made. March is within the optimal period for breeding birds and mammal surveying (with the exception of bats) as tracks and other field signs can easily be read. A separate series of bat surveys was undertaken by Brian Keeley during the optimal survey period. This report is presented separately however its findings are incorporated here.The nomenclature for vascular plants is taken from The New Flora of the British Isles (Stace, 2010) and for mosses and liverworts A Checklist and Census Catalogue of British and Irish Bryophytes (Hill et al., 2009).

5.3 Existing Receiving Environment

5.3.1 Zone of Influence

Best practice guidance suggests that an initial zone of influence be set at a radius of 2km for non-linear projects (IEA, 1995). However, some impacts are not limited to this distance and so sensitive receptors

further from the project footprint may need to be considered as this assessment progresses. This is shown in figure 1.

There are a number of designations for nature conservation in Ireland including National Park, National Nature Reserve, RAMSAR site, UNESCO Biosphere reserves, Special Protection Areas (SPA – Birds Directive), Special Areas of Conservation (SAC – Habitats Directive); and Natural Heritage Areas. The mechanism for these designations is through national or international legislation. Proposed NHAs (pNHA) are areas that have yet to gain full legislative protection. They are generally protected through the relevant County Development Plan. There is no system in Ireland for the designation of sites at a local, or county level.

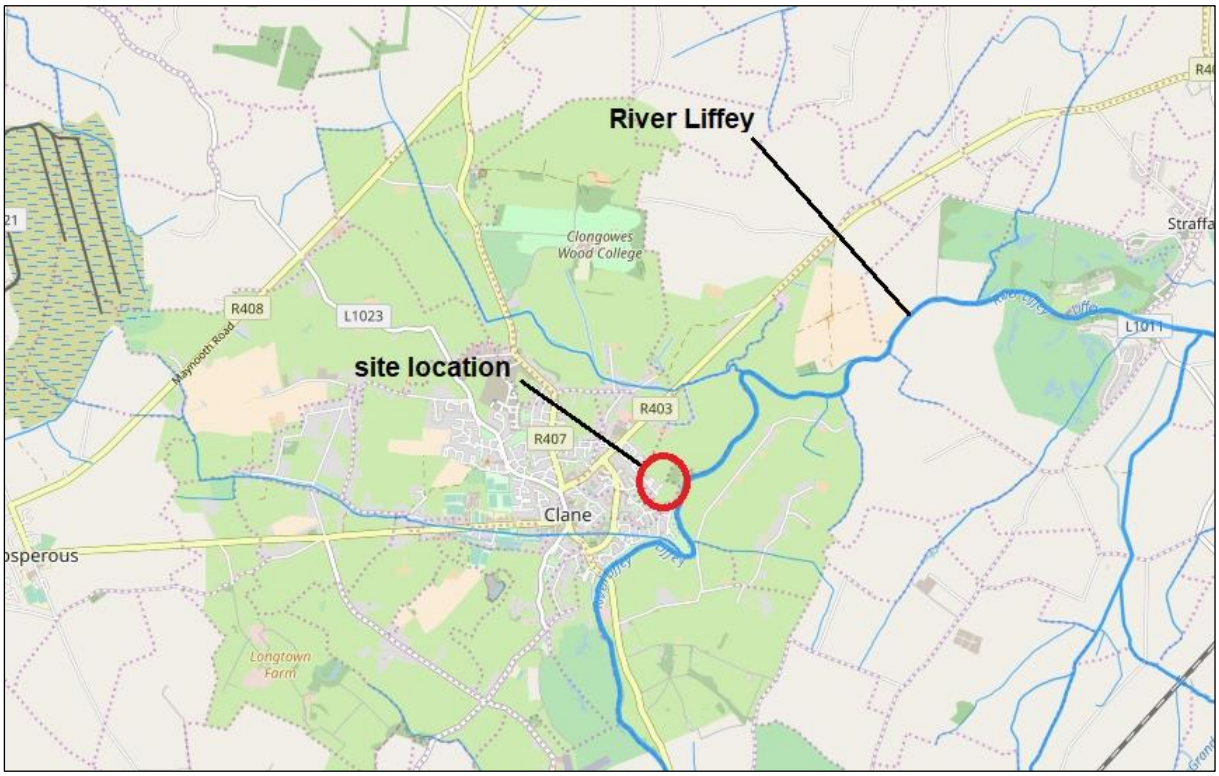

Figure 5.1 Approximate 2km radius of proposed site (red circle) showing local water courses. There are no areas designated for nature conservation in this view (from www.epa.ie).

There are no areas designated for nature conservation within 2km of the site. According to the www.wfdireland.ie website, the lands fall within the catchment of the River Liffey. The Liffey ultimately drains to Dublin Bay where it is subject to a number of designations.

South Dublin Bay SAC (site code: 0210)

This SAC is concentrated on the intertidal area of Sandymount Strand. It has one qualifying interest (i.e. feature which qualifies the area as being of international importance) which is mudflats and sandflats not covered by seawater at low tide.

South Dublin Bay and Tolka Estuary SPA (site code: 4024)

This SPA is largely coincident with the SAC boundary with the exception of the Tolka Estuary. The North Bull Island SPA (site code: 0206) is largely coincident with the North Dublin Bay SAC with the exception of the terrestrial portion of Bull Island. Table 5.1 lists the features of interest for these SPAs.

Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]
Oystercatcher (*Haematopus ostralegus*) [A130]
Ringed Plover (*Charadrius hiaticula*) [A137]

Grey Plover (*Pluvialis squatarola*) [A140]
Knot (*Calidris canutus*) [A143]
Sanderling (*Calidris alba*) [A144]
Dunlin (*Calidris alpina*) [A149]
Bar-tailed Godwit (*Limosa lapponica*) [A157]
Redshank (*Tringa totanus*) [A162]
Black-headed Gull (*Croicocephalus ridibundus*) [A179]
Roseate Tern (*Sterna dougallii*) [A192]
Common Tern (*Sterna hirundo*) [A193]
Arctic Tern (*Sterna paradisaea*) [A194]
Wetlands & Waterbirds [A999]

Table 5.1 Features of interest for the South Dublin Bay and Tolka Estuary SPAs in Dublin Bay (EU code in square parenthesis).

Bird counts form BirdWatch Ireland are taken from Dublin Bay as a whole and are not separated between the two SPAs in this area. Dublin Bay is recognised as an internationally important site for water birds as it supports over 20,000 individuals. Table 5.2 shows the most recent count data available.

Year	2010/11	2011/12	2012/13	2013/14	2014/15	Mean
Count	27,931	30,725	30,021	35,878	33,486	31,608

Table 5.2 Annual count data for Dublin Bay from the Irish Wetland Birds Survey (IWeBS).

There were also internationally important populations of particular birds recorded in Dublin Bay (i.e. over 1% of the world population): Light-bellied brent geese Branta bernicula hrota; Black-tailed godwit Limosa limosa; Knot Calidris canutus and Bar-tailed godwit L. lapponica. The NPWS web site (www.npws.ie) contains a mapping tool that indicates historic records of legally protected species within a selected Ordnance Survey (OS) 10km grid square.

The subject site is located within the square N82 and no protected species are highlighted. It must be noted that this cannot be interpreted as meaning that protected species are absent. Water quality is monitored on an on-going basis by the Environmental Protection Agency (EPA). They assess the pollution status of a stretch of water by analysing the invertebrates living in the substrate as different species show varying sensitivities to pollution. They arrive at a 'Q-Value' where Q1 = grossly polluted and Q5 = pristine quality (Toner et al., 2005).

The Capdoo site is within the catchment of the River Liffey. Mapping from OSI and the EPA show no water courses on these lands although the boundary is approximately 50m from the banks of the Liffey. There nearest monitoring point along the River Liffey, at Alexander Bridge upstream of Clane most recently (2016) showed Q4 conditions (unpolluted). The EU's Water Framework Directive (WFD) stipulates that all water bodies are to attain 'good ecological status' by 2015 or, with exemptions, 2027 at the latest. This includes all rivers and the Liffey was originally located within the Eastern River Basin District. In 2010 the first River Basin Management Plan (RBMP) was published to address ecological issues and this included a 'programme of measures' which was to be completed. The stretch of the Liffey from its headwaters as far downstream as Celbridge is classified as 'good'.

This classification indicates that current water quality is of a sufficient standard to meet the requirements of the WFD. In 2018 a second RBMP was published and under which all water bodies in Ireland fall within a single River Basin District. The River Liffey now falls within the Eastern Region. This plan has identified 190 'priority areas for action' which will form the focus of resource allocation for the 2018-2021 period. A number of tributaries of the Liffey are among these areas, including the Lyreen and the Morrell.

5.3.2 Stakeholder Consultation

Because of the low ecological sensitivity of this site no third party observations were sought.

5.3.3 Site Survey

Aerial photography from the OSI and historic mapping shows that these lands are in agricultural use however the town of Clane continues to see urban-style expansion with land use change from agricultural to built surfaces.

5.3.4 Flora

The site was visited for this study on August 2nd 2018 and again on March 21st 2019 and habitats are described here with reference to the standard classification system (Fossitt, 2000). It was found that the lands comprise a series of agricultural fields with traditional field boundaries. The two fields to the north-west are both improved agricultural grassland – GA1 with common species such as Perennial Rye Lolium perenne and Clovers Trifolum sp. They had been recently cut. The field to the south is not in agricultural use and is a combination of dry meadow – GS2 and bare ground – ED2. Grasses dominate, such as Creeping Bent Agrostis stolonifera and Cock's-foot Dactylis glomerata but there are also broad-leaved plants such as Willowherbs Epilobium sp., Thistles Cirsium sp., and Nettle Urtica dioica. These habitats are of low biodiversity value. The field to the north-east is recently-felled woodland – WS5 and had little vegetation. This is bordered by a band of scrub – WS1 with Grey Willow Salix cinerea, Hawthorn Crataegus monogyna, Brambles Rubus fruticosus agg. and Elder Sambucus nigra. This is a form of immature, native woodland which is to be retained in the design proposals.

Field boundaries are either hedgerows – WL1 or treelines – WL2. These can be similar in species composition and differ in that treelines are dominated by tall trees over 5m in height. Methodology is available from the Heritage Council which evaluates the quality of field boundaries based upon their age, species diversity and structure (Foulkes et al., 2013). These field divisions appear on historic OSI maps from 1888-1913 and so are of significant age. The boundary to the east appears as a townland boundary and so may be ancient (8th Century). All boundaries are evaluated as 'higher significance' due to their age and species diversity. Trees and woody species typically comprise Ash Fraxinus excelsior, Grey Willow, Hawthorn, Wych Elm Ulmus glabra, Ivy Hedera helix, Elder and Honeysuckle Lonicera periclymenum. Ground flora includes Herb Robert Geranium robertianum, Primrose Primula vulgaris and Lords-and-Ladies Arum maculatum along with the ferns: Soft-shield Fern Polystichum setiferum and Hart's-tongue Asplenium scolopendrium. These treelines and hedgerows are dense and well-structured, providing excellent habitat for a range of plants and animals, and are of high local value to biodiversity.

Some of these are associated with drainage ditches – FW4 although these were dry on the day of survey. It could be seen however that they are wet on occasion and this was evidenced by the presence of wetland plants such as Water Mint Mentha aquatica, Angelica Angelica sylvestris and Purple-loosestrife Lythrum salicaria. These drain towards the River Liffey, which passes along to the site boundary to the east. The River Liffey at this point is a lowland, depositing river – FW2, which is lined with trees, particularly Alder Alnus glutinosa and Willow Salix sp. In the water itself there are stands of the Common Club-rush Schoenoplectus lacustris. Between the river there is a walking path and the habitats within this band can best be described as scrub, as previously described. No plant species were found which is listed as alien invasive under Schedule 3 of S.I. 477 of 2011. No rare or threatened plant species was recorded. There are no habitats which are examples of those listed in Annex I of the Habitats Directive while there is no evidence that species listed in Annex II of that Directive are present.

5.3.5 Fauna

The site survey included incidental sightings or proxy signs (prints, scats etc.) of faunal activity, while the presence of certain species can be concluded where there is suitable habitat within the known range of that species. Table 5.3 details those mammals that are protected under national or international legislation in Ireland and their known status within the zone of influence 2. Cells are greyed out where suitable habitat is not present or species are outside the range of the study area. Those that are greyed out indicate either that suitable habitat is not present or that there are no records of the species from the National Biodiversity Date Centre.

Species	Level of Protection	Habitat[1]
Otter *Lutra lutra*	Annex II & IV Habitats Directive; Wildlife (Amendment) Act, 2000	Rivers and wetlands
Lesser horseshoe bat *Rhinolophus hipposideros*		Disused, undisturbed old buildings, caves and mines
Grey seal *Halichoerus grypus*	Annex II & V Habitats Directive; Wildlife (Amendment) Act, 2000	Coastal habitats
Common seal *Phocaena phocaena*		
Whiskered bat *Myotis mystacinus*	Annex IV Habitats Directive; Wildlife (Amendment) Act, 2000	Gardens, parks and riparian habitats
Natterer's bat *Myotis nattereri*		Woodland
Leisler's bat *Nyctalus leisleri*		Open areas roosting in attics
Brown long-eared bat *Plecotus auritus*		Woodland
Common pipistrelle *Pipistrellus pipistrellus*		Farmland, woodland and urban areas
Soprano pipistrelle *Pipistrellus pygmaeus*		Rivers, lakes & riparian woodland
Daubenton's bat *Myotis daubentonii*		Woodlands and bridges associated with open water
Nathusius' pipistrelle *Pipistrellus nathusii*		Parkland, mixed and pine forests, riparian habitats
Irish hare *Lepus timidus hibernicus*	Annex V Habitats Directive; Wildlife (Amendment) Act, 2000	Wide range of habitats
Pine Marten *Martes martes*		Broad-leaved and coniferous forest
Hedgehog *Erinaceus europaeus*	Wildlife (Amendment) Act, 2000	Woodlands and hedgerows
Pygmy shrew *Sorex minutus*		Woodlands, heathland, and wetlands
Red squirrel *Sciurus vulgaris*		Woodlands
Irish stoat *Mustela erminea hibernica*		Wide range of habitats
Badger *Meles meles*		Farmland, woodland and urban areas
Red deer *Cervus elaphus*		Woodland and open moorland
Fallow deer *Dama dama*		Mixed woodland but feeding in open habitat
Sika deer *Cervus nippon*		Coniferous woodland and adjacent heaths

Table 5.3 Mammals that are protected under national or international legislation in Ireland.

No direct evidence of mammal activity was recorded. No setts were found and there is no evidence that Badgers are using the lands. August is considered to be a sub-optimal month for Badger survey due to overgrown vegetation which obscures field signs. In this instance, access to field boundaries was not problematic. A dedicated bat survey was carried out on August 15th and 16th 2018 and this report is presented separately. It found no evidence of bats roosting on the site. Five species were recorded foraging or commuting: Common and Soprano Pipistrelle, Nathusius' Pipistrelle, Leisler's Bat and Daubenton's Bat. Suitable habitat is not present for Pine Marten or Red Squirrel. Irish Stoat, Hedgehog,

[1] Harris & Yalden, 2008

Pygmy Shrew and Irish Hare are considered widespread (Lysaght & Marnell, 2016). There was no evidence that deer are using the site. While there are no records of Otter from the Liffey in Clane, and no direct evidence of their presence was found during the surveys, the habitat here is ideal for the species and their presence must be assumed.

Non-protected mammals which are likely to be present include Wood Mouse Apodemus sylvaticus, House Mouse Mus domesticus, and Brown Rat Rattus norvegicus. Rabbits Oryctolagus cuniculus and Fox Vulpes vulpes are likely to be present also. March falls within the bird breeding season. Species noted were: Wren Troglodyes troglodyes, Magpie Pica pica, Chaffinch Fringilla coelobs, Great Tit Parus major and Goldfinch Carduelis carduelis. Each of these birds is listed by BirdWatch Ireland as being of 'low conservation concern' (Green List, Colhoun & Cummins, 2013). The drainage ditches may provide suitable habitat for spawning Common Frog Rana temporaria although during the August survey these had dried out complete. No spawn was noted during the March survey. Common Lizard Lacerta vivipara is considered common and widespread. Drainage ditches on the site are of low fisheries value and are not suitable for salmonid fish (Atlantic Salmon Salmo salar or Brown Trout S. truttta). The River Liffey is of salmonid status however, with a run of Brown Trout and Salmon, as well as European Eel Anguilla anguilla.

Most habitats, even highly altered ones, are likely to harbour a wide diversity of invertebrates. In Ireland only one insect is protected by law, the Marsh Fritillary butterfly Euphydryas aurinia, and this is not to be found in intensive agricultural grassland. Other protected invertebrates are confined to freshwater and wetland habitats and so are not present on this site.

Figure 5.2 Habitat map of the subject lands (aerial photo from www.google.com).

5.4 Overall Evaluation of the Context, Character, Significance and Sensitivity of the Proposed Development Site

In summary it has been seen that the application site is within an area of agricultural and former forestry land with traditional field boundaries. There are no examples of habitats listed on Annex I of the Habitats Directive or records of rare or protected plants. There are no plant species listed as alien invasive. Field boundaries provide habitat for a variety of plant and animal species including breeding birds and foraging bats. Significance criteria are available from guidance published by the National Roads Authority (NRA, 2009). From this an evaluation of the various habitats and ecological features on the site has been made and this is shown in Table 5.4.

River Liffey – FW2	County value
Hedgerows – WL1 Treelines – W2	High local value
Dry meadow – GS2 Scrub – WS1	Low local value
Improved agricultural grassland – GA1 Spoil and bare ground – ED2 Recently-felled woodland – WS5	Negligible ecological value

Table 5.4 Evaluation of the importance of habitats and species on the subject site.

5.5 Potential Effects of the Proposed Development

This section provides a description of the potential impacts that the proposed development may have on flora & fauna in the absence of mitigation. Methodology for determining the significance of an impact has been published by the EPA. In this way it is possible to assign an impact significance in a transparent and objective way. Table 5 summaries the nature of the predicted impacts.

5.5.1 Construction Phase

The following potential impacts are likely to occur during the construction phase in the absence of mitigation:

1. The removal of habitats including agricultural grassland, dry meadow, cleared woodland, spoil and sections of internal field boundary. Sections of external hedgerows and treelines are to be retained along with associated sections of ditch. It is calculated that 462m of hedgerow and treeline boundary are to be removed, while 1,320m are to be retained. Where removed hedgerow coincided with a ditch, the ditch is to be culverted. In total therefore, 75% of the field boundaries are to be retained. A wide margin of existing immature woodland along the River Liffey (~25m) is to be retained. No works are to be undertaken at the river and so this habitat will not be directly affected.

2. The direct mortality of species during demolition. This impact is most acute during the bird breeding season which can be assumed to last from March to August inclusive. Trees, hedgerows and areas of scrub provide suitable nesting habitat and mitigation will be required during the construction phase as all birds' nests and eggs are protected under the Wildlife Act. Tree felling can impact upon bats which may be roosting in small spaces. The bat survey report has recommended mitigation measures to avoid this impact.

3. Pollution of water courses through the ingress of silt, oils and other toxic substances. The site is close to drainage pathways which reach the River Liffey and the ingress of silt, in particular, can result in degradation of fish habitat.

4. Impact to trees and hedgerows to be retained. The compaction of soil within the root zones of trees, through the movement of machinery or the storage of construction materials, can result in permanent damage to trees. Without proper safeguards, this could affect all of the trees and linear woodlands to be retained.

5.5.2 Operation Phase

The following potential impacts are likely to occur during the operation phase in the absence of mitigation:

5. The subject development will result in additional volumes of foul wastewater. Wastewater from the development will be treated at the Osberstown wastewater treatment plant. This is licenced by the EPA to discharge treated effluent to the River Liffey (licence no. D0002-01). The plant is licenced to discharge treated effluent to the River Liffey by the EPA. It has a capacity to treat wastewater for a population equivalent (P.E.) of 130,000. The Annual Environmental Report (AER) for 2017 shows that the average loading was well within this capacity while the standard of effluent was fully compliant with emission limit values set under the Urban Wastewater Treatment Directive. Monitoring of the receiving water (i.e. the River Liffey) takes place at points upstream and downstream of the discharge point. The AER states that "The discharge from the wastewater treatment plant may have an impact on the Water Framework Directive status. However, the upstream BOD is close to the EQS threshold and improvements in the sewer network are expected to lead to further improvements in the receiving water quality." This development will increase demand on the treatment plant however suspected pollution issues are not related to the treatment plant capacity.

6. Surface water run-off from roofs and driveways will be retained within the curtilage of each dwelling through the employment of rain-water harvesting tanks and permeable pavements. Surplus run-off will discharge to a surface water sewer via attenuation storage tanks, flow control devices and oil/grit interceptors. These will be split over two catchments within the development. In this way surface water quantity and quality will be maintained at a 'greenfield' standard.

7. Artificial lighting. Artificial lighting can affect areas beyond the site boundary. This may including the River Liffey, which is a sensitive habitats from fisheries perspective, as well as associated aquatic and riparian wildlife. The intrusion of lighting can deter certain species and is known to affect fish and bats in particular. The bat report states that "lighting may affect bat species, in particular, light-intolerant bat species during foraging and if directed at emergence points would affect all bat species, even those that will feed in illuminated areas." A lighting plan has been prepared however final details of lighting will only be provided post-planning. Mitigation has therefore been recommended to address this impact and the proposed lighting scheme will be amended as required to ensure that negative impacts do not arise.

No impacts are predicted to occur Natura 2000 areas (SACs or SPAs) in Dublin Bay, principally due to the separation distance between the site and these areas. A full assessment of potential effects to these areas is contained within a separate Screening Report for Appropriate Assessment.

Impact		Significance
Construction phase		
1	Loss of habitat	Moderate negative
2	Mortality to animals during construction	Moderate negative – permanent impacts to species of high local value/or species with legal protection
3	Pollution of water during construction phase	Moderate negative
4	Damage to trees to be retained	Moderate negative
Operation phase		
5	Wastewater pollution	Neutral
6	Surface water pollution	Neutral
7	Artificial lighting	Moderate negative

Table 5.5 Significance level of likely impacts in the absence of mitigation.

Overall it can be seen that five potentially moderate negative impacts are predicted to occur as a result of this project in the absence of mitigation.

5.6 Cumulative Impacts

A number of the identified impacts can also act cumulatively with other impacts from similar developments in the Clane area. These primarily arise through the urbanisation of the town's hinterland as provided for by land use zoning and include: loss of habitats, particularly hedgerows and treelines, artificial lighting, pollution from surface water run-off and pollution from wastewater generation.A cumulative loss of wildlife value however will be experienced as land use changes in this area from open agricultural to suburban. This is offset somewhat as open green spaces and private gardens mature over time. It is considered that the species which are already present in this area will not suffer long term consequences arising from this land use change. The subject lands are zoned for residential development under the Clane Local Area Plan 2017-2023. This plan was subject to AA Screening by the planning authority and this concluded that its implementation would not result in negative effects to Natura 2000 areas.

Under the second River Basin Management Plan of the WFD, published in 2018, the number of tributaries of the Liffey are identified as among the 190 'priority areas for action' where resources are to be focussed over the 2018-2021 period.

5.7 Avoidance, Remedial and Mitigation Measures

This report has identified five impacts that were assessed as 'moderate negative' and therefore mitigation is needed to reduce the severity of these potential effects. This may arise due to loss of habitat, where demolition works are undertaken during the nesting season, the potential to pollute the River Liffey during construction, and the damage to trees and hedges to be retained. There are no bat roosts on the site.

5.8 Mitigation Measures Proposed

The following mitigation measures are proposed for the development

Construction Phase

1: Loss of Habitat – mitigation by offset

A 'woodland regeneration area' is included in the landscaping plans. This will allow the existing scrub vegetation to mature over time and will bolster the integrity of the riparian corridor and its wildlife value. 75% of the native hedgerows on the site are to be retained and reinforced within the project design. There will be significant hedgerow replacement to the rear of houses 76-93 and tree planting throughout the development to be undertaken as outlined in the landscaping plan prepared by Landmark Designs While taking time to mature, it is envisaged that the extent of new planting, along with the retention of existing features, will result in a net neutral impact to biodiversity.

2a:Mortality to animals during construction – mitigation by avoidance

Deliberate disturbance of a bird's nest is prohibited unless under licence from the National Parks and Wildlife Service. The removal of vegetation will be undertaken outside the nesting period (March to August inclusive). Where this is not possible, vegetation must be inspected for the presence of nests. If no nest is found, vegetation can be removed within 48 hours. Where a nest is found, vegetation can only be removed after young birds have fledged, or under licence.

2b: Mortality to animals during construction (bats) – mitigation through avoidance

The following is taken from the bat report:

> *Mature trees with bat roost potential will be felled in late autumn. This would include the months of September and October. Should the trees be felled in winter, an evaluation of the trees shall be carried out by a bat specialist prior to felling. Surveying in winter may not be possible by way of a bat detector assessment and a visual examination undertaken by a licensed bat specialist would be required. This would most probably necessitate access to height and the use of a fibrescope if nay trees are considered to have good potential for hibernation.*

Figure 5.4 Landscaping plan.

3: Pollution during construction – mitigation through avoidance

A Construction Method Statement will be prepared, and which should include pollution prevention measured in accordance with best practice guidelines from Inland Fisheries Ireland (2016). This should identify the location of the site compound, storage areas for potentially polluting substances, and specific measures to prevent the loss of silt-laden water to any water course. It should include the installation of suitably designed silt traps, so that any discharge is only of clean, silt-free water.

Operation Phase

4: Tree damage – mitigation by avoidance

To avoid damage to trees the developer will follow the guidance from the National Roads `Authority in establishing root protection areas (RPA) along hedgerows to be retained. The NRA gives the following equation for calculating the root protection area (RPA) (NRA, unknown year):

RPA(m2) = π(stem diameter mm 12)/1,000) x2

The RPA gives the area around which there should be no disturbance or compaction of soil. This will be calculated for the largest tree within each hedgerow. Prior to construction this area will be clearly labelled ‘sensitive ecological zone’, fenced off with durable materials and instruction given to construction personnel not to disturb this buffer zone. As a rule of thumb this buffer zone should extend at least to the canopy of the trees concerned.

5: Artificial lighting – mitigation by reduction

The lighting plan has been reviewed by the bat ecologist to ensure that overspill to sensitive areas are avoided. Lighting can be minimised by the use of cowels and louvres as well as appropriate intensity bulbs. The following text is taken from the bat report:

> *Lighting must be designed that will limit overspill from the required area for illumination and prevent light pollution. This should aim to avoid mature trees and the river vegetation in particular but must also avoid illumination of potential roost sites such as the buildings to the north of the site. LED is the most energy efficient source available and wherever a permanent source of night lighting is unessential, it should be motion-activated.*

The report also recommends that enhancement measures be undertaken including the erection of bat boxes and the planting of nectar-producing plants. Specific details are provided in the report.

5.9 Predicted Impacts of the Proposed Development

This section allows for a qualitative description of the resultant specific direct, indirect, secondary, cumulative, short, medium and long-term permanent, temporary, positive and negative effects as well as impact interactions which the proposed development may have, assuming all mitigation measures are fully and successfully applied.

There will be creation of high-quality amenity space along river Liffey with retention/incorporation of existing immature woodland habitat. There is significant new planting proposed throughout with native species and those suitable for pollinators and for wildlife habitat. With mitigation in place, the impacts will be reduced so that no moderate negative impact (or greater) remains. Full mitigation is not available to offset the loss of high local value treelines and hedgerows and so there will be a moderate negative impact arising to biodiversity from this aspect of the project. Over time the immature woodland, retained hedgerows and planting scheme proposed will limit any negative effect so that in time, the long-term impact will be slight or neutral.

5.9.1 Do Nothing Impact

In the absence of the current project the biodiversity of the site is not likely to change significantly over time. Current management will continue, maintaining the high biodiversity value of field boundaries.

5.10 Interactions

There are interactions between biodiversity and the landscaping and water/hydrology chapters. Measures to enhance the surface water characteristics from the site (through SUDS) will also benefit water bodies by improving water quality and reducing pulse flow impacts. The introduction of soft landscaping will provide habitat for invertebrates and birds.

Detailed mitigation measures are proposed in the water and landscaping chapters of the EIAR. With these mitigation measures in place the resultant interaction between biodiversity, water and landscape will be neutral.

5.11 Monitoring

Monitoring is required where the success of mitigation measures is uncertain or where residual impacts may in themselves be significant. After mitigation, no significant effects are likely to arise as a result of this development to flora and fauna and so monitoring is not required.

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6.0 LAND, SOILS, GEOLOGY AND HYDROGEOLOGY

6.1 Introduction

This chapter presents the assessment of impact and effects of the proposed Development with respect to land, soils geology and hydrogeology during both the construction and operational phases of development. Mitigation measures are identified and outlined where necessary.

Key issues to be addressed include the potential for contamination of underlying soils and groundwater during the construction phase and potential impacts on groundwater recharge as a result of proposed development. Indirect potential effects on groundwater recharge such as alteration of river base flow will be identified and assessed where relevant. Potential impacts on soils will be assessed in terms of erosion, compaction and sealing. The amended EIA directive 2014/5/2/EU introduced "Land" as a prescribed environmental factor. The draft EPA Guidelines on Information to be contained in Environmental Impact Assessment Reports, 2017 gives context to this addition by noting that it refers to the issue of land-take. This is addressed accordingly in Section 6.3.3 below.

6.1.1 Competent Expertise

This chapter has been prepared by Redkite Environmental Ltd with input from specialist assessments and reports prepared by IE Consulting and BCA Consulting Engineers dealing with Site Specific Flood Risk Assessment (SSFRA) and infrastructure design respectively.

The assessment was led by Ms. Siobhan Maher of Redkite Environmental Ltd. Relevant qualifications and experience include:

- BSc. Analytical Science (Chemistry) from Dublin City University;
- Master of Technology (M.Tech.) Environmental Management from University of Limerick;
- Senior Consultant, Malone O' Regan Environmental Services, 1998 -2001;
- Technical Director, Malone O' Regan Environmental Services, 2001 – 2013;
- Business Development, OES Consulting, 2013 – 2014;
- Managing Director, Redkite Environmental Ltd. 2014 – present.

Ms. Maher has over 20 years' experience project managing and preparing assessments for EIARs covering a large variety of project types including major infrastructural projects such as road schemes and ports, industrial projects in the dairy, food processing and pharmaceutical sectors, extractive industries including peat harvesting and leisure, residential and commercial projects. Ms. Maher is also regularly involved in multi-disciplinary assessments for industrial clients with respect to Industrial Emissions licensing requirements for submission to the EPA.

6.2 Assessment Methodology

6.2.1 Desk Study

A desk-based study comprising review of on-line data sources held by a number of public bodies and reports prepared as part of the engineering design was completed.

The following sources were reviewed:

- Environmental Protection Agency (EPA) Geoportal Site http://gis.epa.ie/
- Water Framework Directive – Water Maps Map Viewer (www.wfdireland.ie)
- Geological Survey of Ireland (GSI) public mapping system website (www.gsi.ie).
- Irish Soils Information System (www.gis.teagasc.ie/isis/map.php).

6.2.2 Ground Investigation

An infiltration test report prepared by IGSL was commissioned by BCA Consulting Engineers to inform the design for surface water management for the proposed Development. This report provides some details on underlying soil and groundwater conditions present and was reviewed as part of the desk-based study. The report is included in Appendix 6.1 of this document.

Available geotechnical information held by the GSI was also reviewed.

6.3 Receiving Environment

6.3.1 Soils and Geology

Review of the GSI on-line mapping indicates that the site is underlain by the Dinantian Rickardstown Formation (Rk) and is described as cherty, often dolmitised limestone. The bedrock is more than 100m thick; the full extent is not known. There are no verified boreholes with logs listed on the GSI web-mapping although there is one un-verified borehole log from 1982 located in Abbey Park. Details from this borehole indicate that the rock head was encountered at 14m below ground level (bgl). The GSI summary characterisation of the Naas GWB indicates that there is a very low proportion of this aquifer close to the surface (<1%).

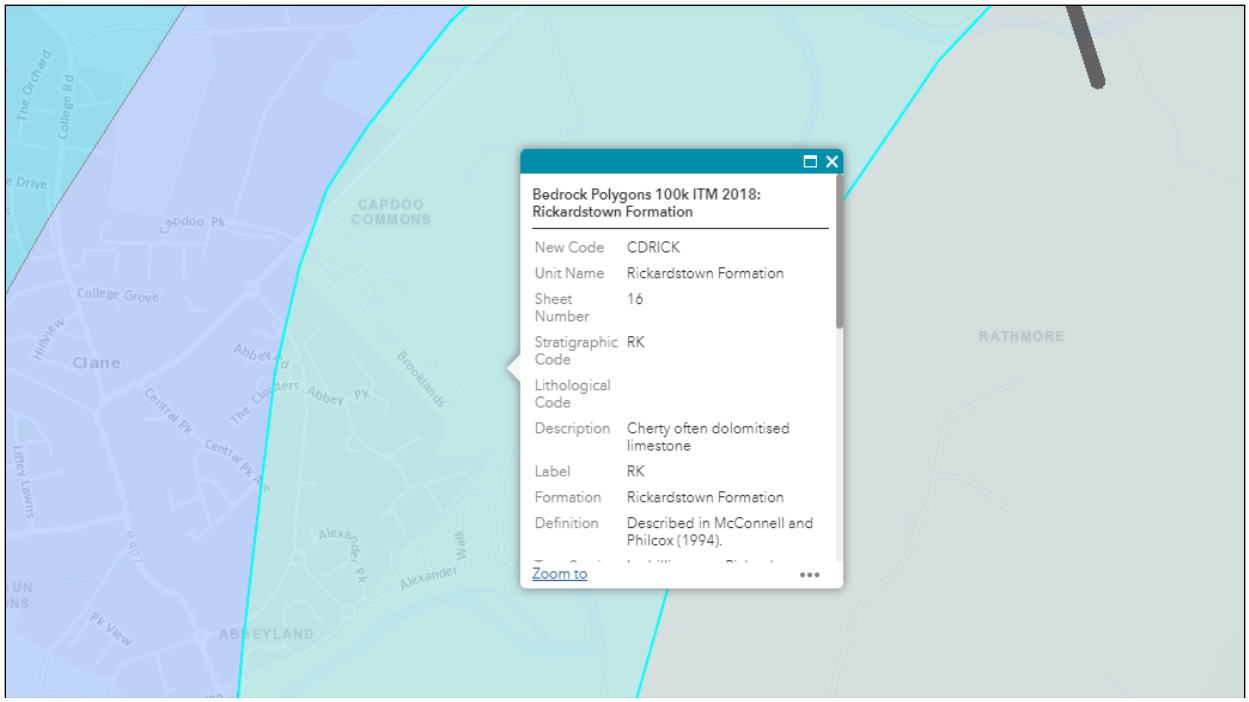

Figure 6.1 Underlying bedrock
(Source: https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?i).

The landform of the proposed Development Site and immediate surrounding areas is described as hummocky sand and gravel on the GSI web-mapping. However, on site inspection, the land is considered to slope moderately from the centre to the boundaries. The underlying quaternary sediments are described on the GSI web-mapping as gravels derived from limestones. The Teagasc maps indicate that the proposed Development Site is mainly underlain by shallow mineral soils derived mainly from calcareous parent materials with some alluvial soils along the boundary with the River Liffey.

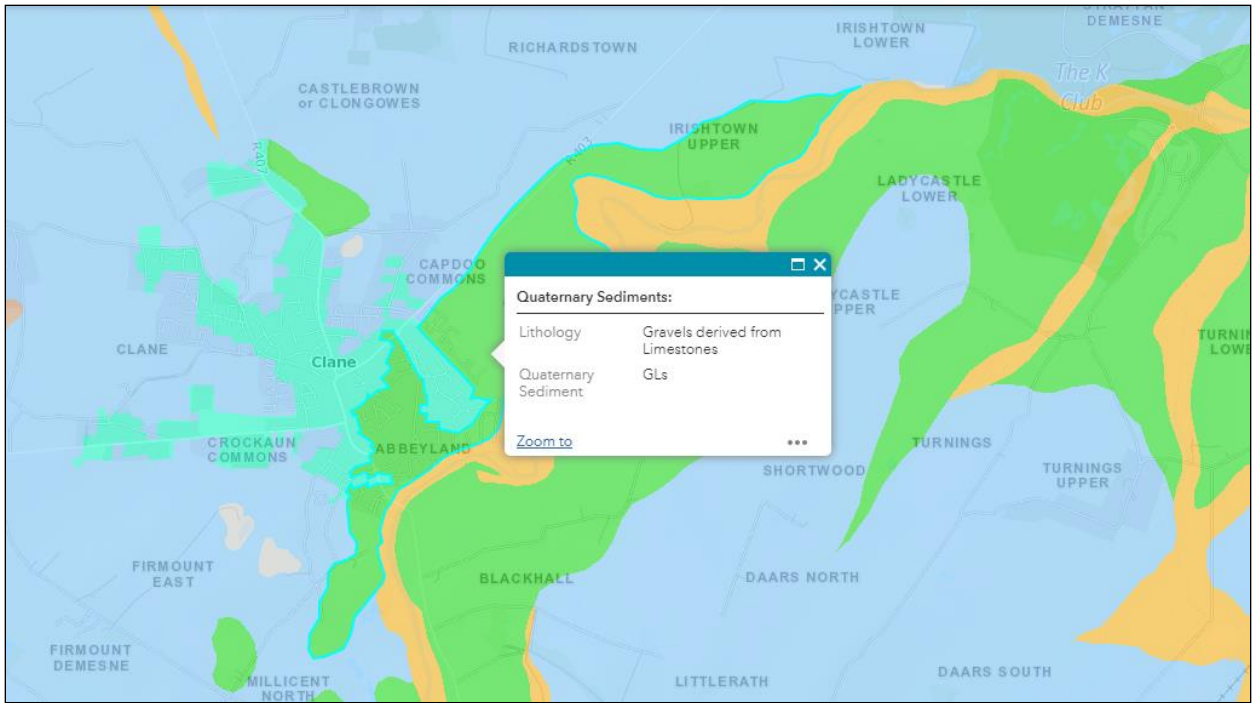

Figure 6.2 Underlying quaternary deposits.
(Source https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?i)

There are no geological heritage sites listed within or in the immediate vicinity of the proposed Development Site.

6.3.2 Hydrogeology

The proposed Development Site underlain by the Naas Groundwater Body (GWB) which covers a total area of 42km^2. It is a regionally important karstified aquifer dominated by diffuse flow. The well records for the Rickardstown Formation in Co. Kildare indicate that there is variability in well yields within very short distances between high and low yielding wells. Transmissivities of only 1 m^2/day have been reported for low yielding wells. In general, the aquifer can be described as productive and the presence of dolomite influences the permeability. Boreholes in the aquifer usually strike water between 0 and 30m. In terms of water resources, the part of the bedrock aquifer underlying the proposed Development Site is described as locally important (Lk) – karstified.

The hydrological setting description for the Naas GWB on the GSI web - mapping is described as highly permeable sub-soils with sand and gravels overlain by well-drained soils. The groundwater vulnerability is described as high. Groundwater vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Where the subsoil thickness is <3m, the vulnerability is rated as Extreme (the highest risk situation). Where the subsoil thickness is >3m, the vulnerability is rated as High, Moderate or Low (depending on the nature and thickness of the subsoil).

Groundwater recharge is a hydrologic process where water moves downward from surface water to groundwater. Recharge is the primary method through which water enters an aquifer. According to the GSI web-mapping, the average recharge is calculated as 332mm/yr. However, this may be lower based on-site specific conditions encountered.

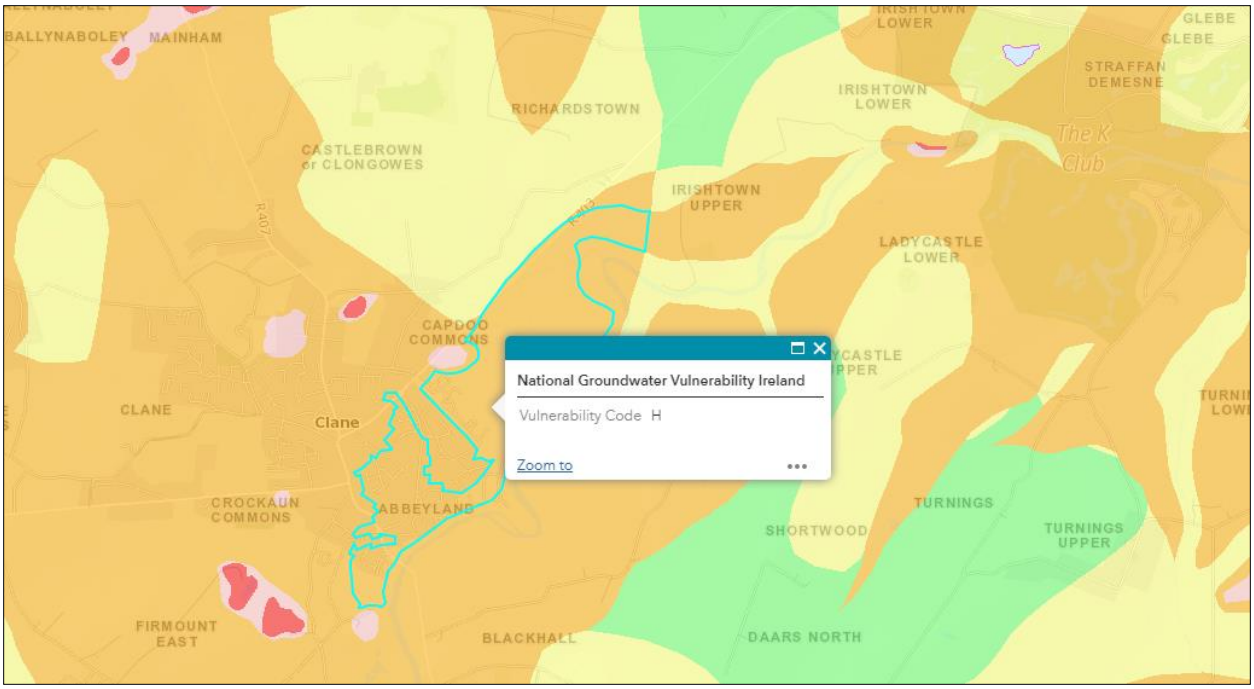

Figure 6.3 Groundwater vulnerability.
(Source: https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?i)

Although the Mid-Kildare Gravel Aquifer overlies a significant portion of the Naas GWB and is in hydraulic continuity with the GWB, there are no gravel aquifers listed as underlying the proposed Development Site.

According to the GSI web-mapping there are no recorded details for wells present on the proposed Development Site.

The nearest groundwater/drinking water protection area is 7.23km to the southwest at Robertstown.

The EPA web-mapping was also consulted as part of the characterisation of the underlying groundwater conditions. The risk status of the Naas GWB under the Water Framework Directive (WFD) has not been assigned and is currently described as 'under review'. The status during the 2010- 2015 iteration of the WFD was described as good.

The topographic gradients within the area of the Naas GWB are generally low although the proposed Development Site slopes moderately. It is likely that hydraulic gradients of the water table follow the existing topography.

According to the GSI, the Naas GWB may discharge to the Liffey and other streams which overlie the aquifer. Although it is not known if the river is in hydraulic connectivity with the bedrock, it is probable that the baseflow of the river is fed by the overlying thick gravels in the area. Furthermore, according to the GSI, the drainage density (higher drainage density, less infiltration, more surface water run-off) appears to be higher where there are no gravel aquifers, suggesting there is discharge to surface waters where the storage contained in the gravels expires.

There is no hydrochemical data available for the Naas GWB. Analogy with other limestone aquifers suggests a calcium-bicarbonate signature and hard waters with high electrical conductivity.

Site Infiltration Tests

Site infiltration tests were completed at 7 test pits to average depths of 0.65m bgl with 2 pits dug to 2.0 and 2.1m bgl. The location of the test pits is indicated in the IGSL report contained in Appendix 6.1. Site specific data indicates that the sub-soils present are mainly brown sandy clays with occasional gravels. Sandy silt and/or slity gravel was encountered in the test pits closest to the River Liffey. Infiltration tests were designed in accordance with BRE Digest 365 'Soakaway Design'. The results of infiltration testing indicate that the soils in the vicinity of SA 02, 03,06 and 07 are relatively impermeable. The results therefore generally indicate that the soil conditions present are not as permeable as the GSI more broad-based mapping for the area indicates.

Groundwater was encountered in test pits SA 06 and 07 at 1.8 and 1.75m bgl respectively.

Groundwater Flood Risk

Possible flood mechanisms for the proposed Development Site were initially examined by IE Consulting. Flooding by groundwater was ruled out. The SSFRA report is contained in Appendix 7.1.

6.3.3 Land-Take

Ireland has an estimated 6.9 million hectares of land, of which, approximately 4.44 million hectares are suitable for agricultural use.[1] Grass is the dominant crop accounting for 80% of utilizable land. The proposed Development Site is currently grassed, in agricultural use and covers an area of 10.36ha. The land has no special features in terms of resources. The site is zoned for residential use and therefore has been considered at a strategic level. Accordingly, in the context of land-take, the proposed Development is considered to be negligible and insignificant.

6.4 Characteristics of the Proposed Development

Site development and construction will be complete in 4 phases (A, B, C and D) over a 5-year plan. Accordingly, the entire proposed Development Site will not be excavated during one event. Site development works will involve the stripping of top-soil layers during each phase. This equates to approximately 11,257m^3 over the entire proposed Development Site. It is anticipated that all of this material will be stored for re-use in landscaped areas.

Excavation of sub-soil layers will be required to allow installation of roads, foundations and drainage and utility installation. It is envisaged that cut and fill will be balanced. Approximately, 13,327 m^3 of sub-soil will be moved within the entire proposed Development Site. Underlying sub-soil is expected to be suitable for non-structural fill. It is likely that dewatering will be required during the construction phase to facilitate the installation of the attenuation tanks and other drainage features.

Up to 11,211m^3 of aggregates, mainly granular in nature, will be imported into the proposed Development Site for structural fill underlying houses, roadways and driveways. This material will mainly be natural stone sourced from local quarries, greenfield inert material imported under the water permitting regime or materials that have been approved as by-products (soil and stones) by the EPA under Article 27 of the European Communities Waste Directive Regulations, 2011. Materials brought to site will be kept separate from on-site material arisings and will be used as soon as required on-site i.e. a "just in time system" will be implemented to avoid stockpiling or the addition of surplus material on site.

In the long term, separate foul and surface water drainage systems will be installed as part of the proposed Development. Refer to Engineering Drawing 18002-303.

Groundwater will not be used as a potable water supply. Water will be supplied from the public mains. Further detail is provided in Chapter 7.0.

[1] http://www.askaboutireland.ie/reading-room/life-society/farming/farming-in-ireland-overvi/land-use-in-ireland/

6.5 Potential Impacts of the Proposed Development

The potential impacts of the proposed Development on soils, geology and hydrogeology are as follows:

Construction Phase

- Stripping of top-soil resulting in the exposure of underlying sub-soils to weather and construction traffic that may result in sub-soil erosion leading to dust emissions and indirect impact on air quality and generation of sediment laden run-off leading to potential indirect impacts on water quality and effects on aquatic ecological receptors;
- Compaction of soils by construction traffic;
- Direct contamination of soils and groundwater through the ingress of oils, chemicals and construction materials such as concrete;
- Dewatering of excavations where groundwater is encountered. Dewatering can cause soil erosion or contamination of water courses with silt and/or oils or chemicals where pumped water has been contaminated.

Operational Phase

- Contamination of soils and groundwater due to the entry of deleterious materials from permeable surfaces;
- Contamination of groundwater arising as a result of incorrect disposal of domestic sewage;
- Reduction of recharge to the underlying bedrock aquifer as a result of increased impermeable surfaces.

6.6 Impact Assessment

Construction Phase

As with any civil engineering project of this nature it is vital to ensure that prior to works commencing on site, adequate mitigation measures are put in place to prevent potential impacts as listed above under Section 6.5 and environmental impacts in general. All such mitigation measures will be detailed within a Construction Environmental Management Plan (CEMP) produced by the Construction Works Contractor (CWC) covering the action required to complete the project in a safe secure manner with respect to the environment. Specific mitigation measures relevant to the potential impacts listed above are detailed under Section 6.7 overleaf.

Operational Phase

The surface water system for the proposed Development has been designed to comply with the requirements of the Greater Dublin Strategic Drainage Study (GDSUDS) policies and guidelines and the requirements of Kildare County Council. The four main criteria to be provided in any development surface water design include:

- Criterion 1: Protection of River Water Quality;
- Criterion 2: River Regime Protection;
- Criterion 3: Level of Service (flooding) for the site;
- Criterion 4: River Flood Protection.

In order to satisfy Criteria 1 and 4, permeable paving has been proposed for driveways which will also collect run-off from adjacent private footpaths and run-off from house roofs. The permeable paving proposed will be underlain with aggregate stone further lined with geogrid geotextile. The proposals will filter run-off thus ensuring that there is no significant impact on the underlying groundwater quality. The nature of the proposed Development does not pose a significant risk of the entry of contaminants to groundwater. Furthermore, in this regard, measures proposed under the Climate Action Plan for Ireland will

also indirectly have a positive impact on reducing risk of contamination of groundwater with hydrocarbons and mineral oil.

The foul drainage system has been designed in accordance with the Building Regulations and specifically in accordance with the principals and methods set out in the Irish Water Code of Practice IS EN752 (2008), IS EN12056 Part 2 (2000) and the recommendations of the GDSUDS.

All new foul drainage lines will be pressure tested and be subject to a CCTV survey in order to identify any possible defects prior to being made operational.

Accordingly, it is not anticipated that the foul sewerage system can potentially leak sewage into the underlying soils and groundwater.

As noted above, the surface water drainage system contains permeable surfaces taking run-off from roofs, drives and private pathways. The overall site development area comprises approx. 27% public open space with private gardens also provided. The amount of impermeable surface has been minimised to mimic the existing drainage regime. The development is therefore unlikely to significantly impact on groundwater recharge to the underlying aquifer which covers a total area of 42km^2.

6.7 Avoidance, Remedial and Mitigation Measures

Construction Phase

The CEMP will include the following specific measures with regard to soils and groundwater (further measures for surface water that may also apply here are detailed in Chapter 7.0):

The works programme for the site development stages will take account of weather forecasts and predicted rainfall in particular. Large excavations and movements of subsoil or vegetation stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

Dewatering

- Dewatering will be conducted whereby soil erosion does not occur as a result. In this regard, removed liquid may be directed to suitable wooded buffers where possible or alternatively settlement ponds.
- Dewatering will be discontinued where signs of erosion occur and under heavy rain conditions where infiltration slows down.

Soil Compaction and Erosion

The site development and construction works will be phased. This measure will inherently prevent the potential for large scale soil erosion.

All stripping of topsoil and excavation works will be completed in a controlled manner.

Topsoil and subsoil spoil heaps will be covered and protected from adverse weather conditions.

Construction traffic will be confined to pre-determined haul routes to minimise soil compaction across the site.

Disturbed sub-soil layers will be stabilised as soon as practicable (e.g. backfilling of service trenches, construction of road capping layers, construction of building foundations and completion of landscaping). The duration that subsoil layers are exposed will be minimised in order to mitigate against weather effects.

Accidental Spills and Leaks

Refuelling and servicing of construction machinery will take place in a designated hard-stand area which is also remote from any surface water ditches.

All oils, fuels, paints and other chemicals will be stored in a secure bunded hardstand area to prevent ingress into soils and groundwater.

Operational Phase

No specific additional mitigation measures are required with regard to soils, geology and hydrogeology.

6.8 Predicted Impact of Proposed Development

Implementation of the measures proposed under Section 6.7 above will ensure that the potential impacts of the Proposed Development on soils, geology and hydrogeology are avoided/minimised. Impacts and potential related effects are expected to insignificant.

There are no predicted impacts arising from the operational phase. Specifically, there will be no impact on the underlying GWB in terms of achieving status goals under the WFD.

6.9 Monitoring and Reinstatement

Monitoring will be required during the construction phase as part of the CEMP. The appointed contractor will draw up a Construction Method Statement (CMS) which will incorporate all of the avoidance and mitigation measures and explain how each of these will be implemented.

The following relates to soils, geology and hydrogeology:

- Pre-commencement monitoring to ensure that soil erosion preventative controls are in place, functioning, inspected and approved;
- Regular inspections to ensure that works are completed in a controlled manner;
- Regular inspection of ground conditions during works, ensuring stability of excavations and timely filling;
- Regular inspection of stockpiles in terms of protection, height and number;
- Regular inspection of chemical and fuel storage arrangements and re-fuelling areas;
- Testing of foul sewerage for leaks and defects prior to operation.
- Record-keeping.

Cut and fill will be balanced therefore all soils and subsoils excavated during the course of the site development works will be reinstated in the completed deevelopment.

No monitoring is proposed for the long-term operational phase of development.

6.10 Cumulative Impacts

There are no specific cumulative impacts to be considered given the scale and nature of the proposed Development with regard to land, soils, geology, hydrogeology and other developments in the area.

7.0 WATER (HYDROLOGY)

7.1 Introduction

This chapter presents the assessment of impacts and related effects of the proposed Development in terms of both the construction and operational phases on water/hydrology and water related material assets including water supply, wastewater and drainage arrangements. Impacts on groundwater/hydrogeology are dealt with in the preceding Chapter 6.0.

The key issue to be addressed in this chapter is the identification and assessment of potential impact on the River Liffey and other watercourses in the area.

This chapter in particular, also considers the vulnerability of the site to flooding and the potential to cause flood impacts downstream.

7.1.1 Competent Expertise

This chapter has been prepared by Ms. Siobhan Maher, Redkite Environmental Ltd with input from specialist assessments and reports prepared by IE Consulting and BCA Consulting Engineers dealing with Site Specific Flood Risk Assessment (SSFRA) and infrastructure design respectively.

Ms. Maher's relevant qualifications and experience include:

- BSc. Analytical Science (Chemistry) from Dublin City University;
- Master of Technology (M.Tech.) Environmental Management from University of Limerick;
- Senior Consultant, Malone O' Regan Environmental Services, 1998 -2001;
- Technical Director, Malone O' Regan Environmental Services, 2001 – 2013;
- Business Development, OES Consulting, 2013 – 2014;
- Managing Director, Redkite Environmental 2014 – present.

Ms. Maher has over 20 years' experience project managing and preparing assessments for EIARs covering a large variety of project types including major infrastructural projects such as road schemes and ports, industrial projects in the dairy, food processing and pharmaceutical sectors, extractive industries including peat harvesting and leisure, residential and commercial projects. Ms. Maher also regularly completes water quality assessments for industrial clients with respect to Industrial Emissions licensing requirements for submission to the EPA.

Details of qualifications and relevant experience of personnel in BCA Consulting Engineers and IE Consulting are detailed below:

- Mr. Brian Connolly, Chartered Engineer, BSc. Eng. MSc. DIC, Ceng, MIEI;
- Mr. Paul McShane, BEng(hons), MIEI.

7.2 Methodology

The assessment included both a desk-based study which involved reviewing available hydrological, water supply and wastewater infrastructure information held by publicly available online resources on the site and surrounding lands and a site visit in July 2019.

The following sources were reviewed:

- Environmental Protection Agency (EPA) Geoportal Site http://gis.epa.ie/
- Water Framework Directive – Water Maps Map Viewer (www.wfdireland.ie)
- Irish Water (IW) website www.water.ie
- Clane Local Area Plan (LAP), 2017 - 2023

The SSFRA completed by IE Consulting takes account of the requirements of *The Planning System and Flood Risk Management – Guidelines for Planning Authorities, DOEHLG, 2009.*

Sources reviewed as part of the SSFRA include reports prepared by the OPW and data available on the OPW www.floodmaps.ie website.

Infrastructure Design Reports prepared by BCA Consulting Engineers for the proposed Development was reviewed and details of pre-submission consultation with IW.

7.3 Surface Water

7.3.1 Receiving Environment

Topography

The north-west part of the proposed site slopes moderately from a high point at the centre of the site towards the north, north-west and north-east site boundaries at an average gradient of approximately 1.23% (1 in 81). The southern half of the proposed site slopes moderately from a high point at the centre of the site towards the south, south-west and south-east site boundaries at an average gradient of approximately 0.81% (1 in 123). The north-east part of the proposed site slopes moderately from a high point at the centre of the site towards the north and east site boundaries at average gradients of approximately 0.77% (1 in 129) and 4.54% (1 in 22) respectively. Existing ground elevations within the site boundary range from approximately 67.56 mOD (Malin) at the centre of the site to 63.408mOD (Malin) at the east boundary of the site.

Water Features Present

The existing site is greenfield and is bounded to the north and northwest by agricultural lands and to the east by the River Liffey. Water features in the vicinity of the development lands are shown on Figure 7.1 overleaf. A drainage channel discharges from the vicinity of Alexandra Walk/Abbey Park Orchard to the south via the development site to the River Liffey. A second drainage channel lies to the northeast of the site boundary and also eventually discharges to the River Liffey via the Gollymochy River.

The most significant water feature in the vicinity of the proposed Development Site is the River Liffey.

The SSFRA report prepared by IE Consulting, included in Appendix 7.1 of this document notes the following with regard to flow characteristics and catchment:

> *The River Liffey is a controlled watercourse along the reach upstream and downstream of Clane. Discharge volumes in the River Liffey along this reach are controlled and monitored by the ESB and are dependent on inflows to Pollaphuca and Golden Falls dams. These dams have a significant beneficial effect in attenuating flood flows in the River Liffey. At its closest position to the proposed development site the River Liffey generally flows in a south to north direction. Utilising the OPW Flood Studies Update (FSU) Portal software, the catchment area of the River Liffey was delineated. As illustrated in Figure 2 below, the total catchment area of the River Liffey was found to be approximately* ***647.32 km²*** *to a point downstream of the site. Assessment of the River Liffey upstream catchment area indicates that the catchment is predominantly rural in nature with urban development accounting for approximately 3.03% of the total catchment area.*

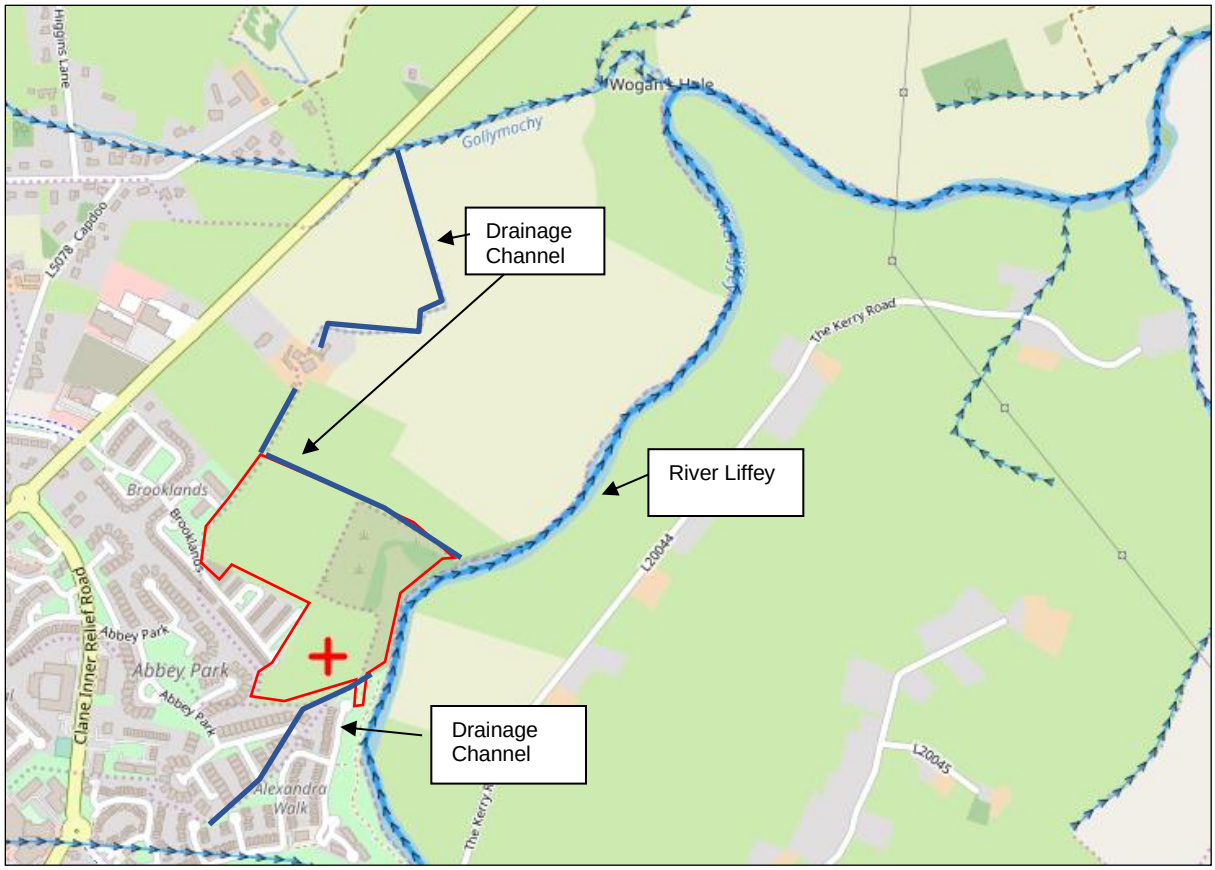

Figure 7.1 Existing water features (Basemap Source: https://gis.epa.ie/EPAMaps/).

Water Quality

The Water Framework Directive (WFD) is a key initiative aimed at improving water quality throughout the EU. It applies to rivers, lakes, groundwater, coastal & transitional waters. The Directive requires an integrated approach to managing water quality on a river basin basis; with the aim of maintaining and improving water quality. The Directive requires that management plans be prepared on a river basin basis and specifies a structured approach to developing those plans. It requires that a programme of measures for improving water quality be brought into effect.

Specifically, the WFD aims to protect/enhance all waters (surface, ground and coastal waters), achieve "good status" for all waters, manage water bodies based on river basins (or catchments), involve the public and streamline legislation.

The proposed Development Site is located in Hydrometric or Water Framework Directive (WFD) Catchment 09 – Liffey and Dublin Bay and in sub-catchment 09_14 or Liffey_SC_070. The overall area of Catchment 09 is 1,624.42km^2.

The WFD status of the River Liffey (IE_EA_09L011600; Liffey_130) adjacent to the proposed Development Site has improved from Moderate in 2007 – 2009 to Good in 2010 – 2015. Classification is based on a number of parameters including bio and chemical status. The River Liffey is considered to be “not at risk” of achieving good status under the WFD. The river, adjacent to the proposed Development Site, is not within any WFD Areas for Action Plans designated under the second round River Basin Management Plan (RBMP) 2018 – 2021. The river in proximity to the proposed Development Site is classed as nutrient sensitive and is within a nutrient sensitive area (downstream of Osberstown Wastewater Treatment Plant (WWTP) to Leixlip Reservoir) under the Urban Waste-Water

Treatment (UWWT) Regulations, 2001 – 2010. IW has recently completed upgrades to the Osberstown WWTP in compliance with regulatory requirements under the UWWT Regulations. According to the EPA's website, there are three water quality monitoring stations in the vicinity of the proposed Development Site. Details are provided in Table 7.1 below.

Station ID	Water-Body Code	Easting Northing	Description	Comments
RS09K260890	IE_EA_09K260890	288514 228559	Kilmurray 09 Bridge Downstream from Irishtown	On Gollymochy River; 475m north of northeastern site boundary.
RS09L011500	IE_EA_09L011500	287970 227044	Liffey, Alexandra Bridge, Clane	Approx. 850m upstream of Development Site on River Liffey
RS09L011550	IE-EA_09L011550	290838 229340	Liffey, Downstream Bridge at Irishtown House	Approx. 2.44km downstream of Development Site, on River Liffey.
RS09L011600	IE-EA_09L011600	292451 229184	Liffey, Straffans Turnings Lower.	95m downstream of Straffan Bridge Approx. 4km downstream of Development Site.

Table 7.1 Water quality monitoring stations.

Water quality can be determined based on chemical and/or ecological parameters. The latest river ecological monitoring results are presented in Table 7.2 below:

Station ID	Q-Value Score	Q-Value Status	Location	Year
RS09K260890	Not available	-	-	-
RS09L011500	4	Good	Upstream	2016
RS09L011550	Not available	-	-	-
RS09L011600	4	Good	Downstream	2016

Table 7.2 Q-Value Status.

Historically, from 1971 – 2018, Q-values scores have varied at the downstream station, Straffan Bridge (RS09L011600) between 3-4. A value of 4-5 was recorded once in 1983. The Q-value score has been 4 since 2010 and the overall Q linear value is 4. The variability at upstream station, Alexandra Bridge is similar with a Q linear value of 4. Based on the Q-values for upstream and downstream stations, water quality is good in the vicinity of the site.

Flood Risk Assessment

IE Consulting prepared a detailed SSFRA for the proposed Development Site. The full report is contained within Appendix 7.1. The SSFRA was undertaken in three principal stages; - Step 1 Screening; Step 2 – Scoping and Step 3 – Assessment.

Possible flood mechanisms for the proposed Development Site were initially examined by IE Consulting. The primary potential flood risk to the proposed Development Site can be attributed to an extreme fluvial flood event in the River Liffey. Other potential flooding mechanisms were ruled out.

The Stage 1 Screening Assessment for the proposed Development Site considered data available on the OPW websites. The 2011 OPW Preliminary Flood Risk Assessment (PFRA) maps for the area were reviewed. The PFRA flood mapping indicates fluvial flood zones adjacent to the east site boundary and within the south-eastern corner of the proposed Development Site. No pluvial or groundwater flood zones are mapped within the boundary of the proposed Development Site. The OPW websites were also interrogated with regard to historic or anecdotal flooding events in the vicinity of the proposed Development Site. A number of flooding incidents have occurred in Clane however these are located in the vicinity of Alexandra Bridge to the southwest of the proposed Development Site. Historic 6 and 25inch mapping does not indicate any historic or anecdotal evidence of flooding within or adjacent to the proposed Development Site.

The Eastern Region Catchment Flood Risk and Management Study (CFRAMS) including final flood maps was published by the OPW in 2016. Flood risk extent and depth maps for further assessment areas within Co Kildare have also been produced. OPW CFRAMS predictive flood map number *E09LA_EXFCD_F1_10* illustrates predictive extreme fluvial flood extent zones associated with the River Liffey in the vicinity of the proposed Development Site.

Figure 10 in Appendix 7.1 (extracted from CFRAMS flood map *E09CAM_EXFCD_F1_24*), illustrates the predicted extreme 10% Annual Exceedance Probability (AEP) (1 in 10 year), 1% AEP (1 in 100 year) or 0.1% AEP (1 in 1000 year) fluvial flood extents in the vicinity of the proposed Development Site.

Figure 10 in Appendix 7.1. indicates that an area of the proposed Development Site falls within a 1% AEP (1 in 100year) and 0.1% AEP (1 in 1000 year) fluvial flood event in the River Liffey.

Predictive fluvial flood depth maps have also been produced as part of the Eastern CFRAM Study for this area of Clane. Figures 11 and Figure 12 contained in the IE Consulting Report in Appendix 7.1. and duplicated from the Eastern CFRAM Study, illustrate the predictive flood depths for the area of the proposed Development Site for the 1% AEP (1 in 100 year) and 0.1% AEP (1 in 1000 year) fluvial flood events respectively.

Figures 11 and Figure 12 in the IE Consulting report contained in Appendix 7.1 indicate predicted 1% AEP and 0.1% AEP fluvial flood depths of 0.25m - 1.0m along the eastern boundary of the proposed Development Site.

Flood mapping from the Kildare County Development Plan 2017 – 2023 was also referenced as part of the Screening Stage of the SSFRA. A mapped fluvial Flood Zone B located close to the eastern site boundary was identified on Map 9.1. of the County Development Plan. This indicates that the proposed Development Site would not be significantly impacted be a 1% AEP (1 in 100 year) or 0.1% (1 in 1000 year) fluvial flood event.

Stage 2 Scoping was completed by IE Consulting as part of the SSFRA. IE Consulting considered that sufficient quantitative information to complete an appropriate flood risk assessment for the proposed Development Site could not be derived from the information collated as part of the screening exercise alone. The main reason was due to the potential for more localised Digital Terrain Model (DTM) errors in the OPW large scale models. Accordingly, Stage 3 Assessment of flood risk was completed including a more accurate site-specific delineation of the predictive 1% AEP and 0.1% AEP fluvial flood extents at the location of the proposed Development Site. In this regard, a topographical survey was completed to prepare a DTM of the site.

Utilising the DTM and the 1 in 100 year (1% AEP) and 1 in 1000 year (0.1% AEP) extreme flood levels for the River Liffey for the reach adjacent to the proposed Development Site, the Site Specific 1% AEP and 0.1% AEP flood zones were delineated.

Drawing Number IE1835-002-A, in Appendix A of the IE Consulting Report contained in Appendix 7.1. illustrates the delineated 1 in 100 year flood extent (Flood Zone 'A') and 1 in 1000 year flood extent (Flood Zone 'B') over the full area of the proposed Development Site. Climate change considerations were taken into account in the modelling undertaken as per the requirements set out by Kildare County Council and in the 2009 Guidelines.

The drawing indicates a small area along the eastern boundary of the proposed Development Site with the River Liffey. The area extends at a maximum up to approx. 70m from the riverbank into the site at the southeastern corner. In general, however the extent of Flood Zone B is <50m from the riverbank.

In the context of the '*Planning System and Flood Risk Management Guidelines, DOEHLG, 2009'* the SSFRA prepared by IE Consulting has determined that the majority of the area of the proposed Development Site is not at significant risk of fluvial, coastal or direct pluvial flooding and therefore falls within Flood Zone 'C'.

7.3.2 Characteristics of the Proposed Development

The proposed Development comprises 305 no. residential units and a creche. A linear park is also proposed along the boundary with the River Liffey. The proposed Development will be served by separate surface and foul water drainage systems. The layout of both systems is illustrated on Drawings 18002-303 -1 to 3. No trade or commercial effluent will be generated as a result of the long-term development.

The construction and site development works will be phased over 5 years. Site development works will involve the stripping of top-soil layers and excavation of sub-soil layers to allow installation of roads, foundations and drainage and utility installation. Topsoil, sub-soil and incoming fill material will be stockpiled at times. Dewatering is likely to be required at times to facilitate the installation of attenuation tanks and deeper foundations.

7.3.3 Potential Impact of the Proposed Development

Construction Phase

Potential impacts on water courses during the construction phase include:

- Direct contamination through the ingress of oils, chemicals and construction materials such as concrete;
- Indirect contamination arising through seepage of chemicals and oils from construction materials and polluted water into the ground and eventually discharging into water courses through groundwater;
- Sediment run-off from construction site activities such as stockpiling, excavations and dewatering.

Operational Phase

Potential impacts arising during the operational phase include:

- Downstream flooding arising as a result of increased built surfaces;
- Direct and indirect contamination of water courses arising as a result of contaminated surface water run-off from parking areas etc.
- Impact on beneficial use of the River Liffey as a water source downstream of the proposed Development.

In addition, the potential for fluvial flooding affecting future residents has been considered.

7.3.4 Impact Assessment

Construction Phase

Silt Run-off and Sedimentation of Water Courses

Excavation works, stockpiling and dewatering associated with the construction phase could give rise to temporary sediment run-off and potentially impact on water quality which in turn can give rise to adverse effects on aquatic ecological receptors.

In this regard, the proposed Development is located directly along the River Liffey, however, the main development area is set back from the river by approx. 85m and will be developed in phases over a 5 - year period. The development of the Linear Park will involve minimal excavation and movement of soils. Works in this area will be small-scale in nature and will involve the use of mini excavators and diggers at most. Accordingly, the potential for sediment run-off to the river is significantly reduced through the proposed design and also through the construction phase mitigation measures detailed in Section 6.7 (under Land, Soils, Geology and Hydrogeology) and as further detailed under Section 7.2.7. below.

The drainage channels located along the northern boundary and a small section of channel flowing from Alexandra Walk into the southeastern corner of the proposed Development Site could also potentially convey sediment and other pollutants to the River Liffey however these will be protected from silt discharge and other pollutants through standard construction phase mitigation measures also detailed under Section 7.2.7 below.

Oils, Lubricants and Construction Materials

The construction of the proposed Development will involve the use of a range of materials and fluids. These include fuels and lubricants used for construction machinery, which if spilled, have the potential to give rise to contamination of surface water and also to soils and ground waters (Refer to Chapter 6.0).

The issue of accidental spillage of hydrocarbons such as diesel and lubrication oil during refuelling of plant machinery is a potential risk during the construction phase. Standard mitigation measures regarding the handling of potentially environmentally hazardous substances such as cement, oils and lubricants are outlined previously in Section 6.7 and as further detailed in Section 7.2.7 below.

Operational Phase

Surface Water Drainage System

Surface water management is designed to comply with the GDSUDS policies and guidelines and the requirements of Kildare County Council.

The surface water drainage system will collect storm water run-off generated from the proposed residential development using traditional pipe-work and manholes laid along the main access roads collecting run-off from impermeable road surfaces via gullies and adjoining areas. In accordance with SUDS principals, permeable paving is provided for all driveways which will also collect run-off from adjacent private footpaths and run-off from house roofs. Permeable paving will provide in curtilage attenuation storage and soakage for run-off.

The surface water drainage system has been designed with two catchments as shown on Drawings 18002-303 -1 -3.

One catchment for the northern portion of the proposed Development will drain to a ditch located in the northern corner of the proposed Development Site. This then flows east along the northern boundary and finally discharges into the River Liffey.

The second, or southern catchment, will drain directly to the River Liffey.

There will be no surface water discharges to existing piped drainage systems.

The surface water will be attenuated in two underground "Stormtech" systems before discharging to the open drain and the River Liffey at controlled flow rates. Flow rates will be controlled by a hydrobrake flow control device at each attenuation storage area to limit discharge to greenfield run-off rates thus preventing downstream flooding.

The attenuation tanks are sized to provide for the 100year pluvial storm event and include for climate change for each catchment. In total, 1,686m^3 of storm water storage is provided within the attenuation facilities.

Based on infiltration tests, the attenuation tanks will be wrapped in bentonite to ensure they are fully protected and sealed.

Oil interceptors will be installed at the entrance to the attenuation tanks to prevent downstream hydrocarbon contamination of watercourses. Furthermore, the placement of interceptors at the entrance to the tanks will ensure that hydrocarbons will be prevented from entering the tanks and adversely affecting the tank material or attenuation capacity. The interceptors will also be placed upstream of the flow control devices to prevent emulsification of hydrocarbons.

Additional Fluvial Flood Risk

The SSFRA prepared by IE Consulting concluded that the majority of the site is classified as Flood Zone C where the probability of flooding from rivers and watercourses is low or negligible (less than 0.1% of 1 in 1000 year for both river and watercourse and coastal flooding).

The proposed residential units are set back from the River Liffey and are all within Flood Zone C. The report concludes:

> *In summary, and in consideration of the findings and recommendations of this Site Specific Flood Risk Assessment, development of the site as proposed would not result in an adverse impact to the existing hydrological regime of the area and would not result in an increased flood risk elsewhere.*
>
> *The development as proposed is therefore considered to be appropriate from a flood risk perspective.*

7.3.5 Avoidance, Remedial and Mitigation Measures

Construction Phase

Many of the mitigation measures outlined in Section 6.7 (under Land, Soils, Geology and Hydrogeology) are similarly being proposed for the protection of surface waters during construction. Due to the sensitivity of receiving waters, the following mitigation measures, will also be implemented under the CEMP to manage potential impacts to hydrology during construction stages, and they include:

- Interception, channelling and discharge of surface water from sumps, excavations and exposed soil surfaces via silt traps and / or settlement lagoons;
- Cordoning off of the drainage ditchs to protect from spillages and contamination form construction materials;
- Construction of silt traps, settlement lagoons / ponds and hydrocarbon interceptors at sensitive outfalls in the early stage of the construction project.
- Construction of cut-off ditches to prevent surface water runoff from entering excavations;

- Placing of granular materials over bare soil in the vicinity of watercourses in order to prevent erosion of fines and rutting by site traffic;
- Storage of fuel, oils and chemicals on impermeable base away from drains and within designated construction compound areas secured against vandalism and unauthorized entry. Fuel storage areas will be bunded to provide adequate retention capacity in the event of a leak or spill occurring;
- Re-fuelling of plant and vehicles on impermeable surfaces away from drains;
- Provision of spill kits, oil booms or oil soakage pads on the site and in particular at areas of high risk with regard to spillage;
- Raw or uncured waste concrete will be disposed of by removal from the site;
- Before release to the environment, wash down water from exposed aggregate surfaces, cast-in-place concrete and from concrete trucks will be treated to a level which will ensure that total suspended solids in discharges to surface waters (including drains) will not exceed 25mg/l. Furthermore, wash out water will not be released to the environment until it has reached a neutral pH;
- Only the chute of the concrete delivery truck will be cleaned on site, using the smallest volume of water necessary. Concrete trucks will be directed back to their batching plant for washout;
- Clearly visible signs will be placed in prominent locations close to concrete pour areas, stating that washout of concrete lorries is not permitted on the site;
- The arrangements for concrete deliveries to the site will be discussed with suppliers before commencement of work, agreeing routes, prohibiting on-site washout and discussing emergency procedures;
- So as to avoid spillage, concrete will not be transported around the site in open trailers or dumpers. All concrete used will be pumped directly into the shuttered formwork from the delivery truck;
- Concrete pours will be avoided where prolonged periods of heavy rain are forecast and covers will be available for freshly placed concrete to avoid the surface washing away in heavy rain;
- Installation of wheel wash and plant washing facilities with fluid retention for appropriate treatment and disposal;
- 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 Acts of 1996 and 2001, and,
- Implementation of waste minimisation measures with correct handling, storage and disposal of waste.

Operational Phase

The following measures with regard to fluvial flood risk have been recommended by IE Consulting and will be implemented as part of the proposed Development:

- Proposed finished ground levels (road levels, etc) will be constructed to a minimum level of 0.15m above the maximum predicted 0.1% AEP flood level upstream of the site – i.e. 65.18m + 0.15m = **65.33m OD**.
- Proposed finished floor levels will be constructed to a minimum level of 0.30m above the maximum predicted 0.1% AEP flood level upstream of the site – i.e. 65.18m + 0.30m = **65.48m OD**.

Furthermore, with regard to potential on-site pluvial flooding provision, the following will be provided:

- The surface water network, attenuation storage and site levels are designed to accommodate a 100 year storm event and include climate change provision.
- Floor levels of houses are set above the 100 year flood levels by a minimum of 0.5m for protection. For storms in excess of 100 years, the development has been designed to provide overland flood routes along the various development roads towards the surface water drainage outfall.

A contract will be entered into with a suitably qualified contractor for maintenance of the attenuation system, Hydrobrake and full retention fuel / oil separator noted above.

7.3.6 Predicted Impact of the Proposed Development

Construction Phase

Implementation of the measures outlined in Section 7.2.7 and 6.7 in Chapter 6.0 will ensure that potential impacts on surface water do not occur as a result of the site development and construction phases.

Operational Phase

As the proposed surface water drainage regime has been designed in accordance with the GDSDS and SuDS methodologies are being implemented as part of a treatment train approach, there are no predicted impacts on surface water quality or the hydrological regime arising as a result of the proposed Development.

7.3.7 Monitoring and Reinstatement

Proposed monitoring during the site development and construction phase set out in Section 6.9 relating to soils, geology and hydrogeology are equally applicable to surface water. Additionally, the following will be completed:

- Monitoring and inspection of sediment control measures e.g. settlement ponds and discharges (pH, visual inspection and sediment content).
- Monitoring cleanliness of adjacent road surfaces to prevent sediment run-off to gullies and road drains and implementation of dust suppression and wheel wash facilities to prevent uncontrolled build-up on roads.

During the operational phase an inspection and maintenance contract will be implemented in relation to the proposed Class 1 full retention fuel / oil separators.

7.3.8 Cumulative Impacts

There are no specific cumulative impacts to be considered given the scale and nature of the proposed Development with regard to hydrology and other developments in the area.

7.4 Water Supply

7.4.1 The Receiving Environment

Clane is served by the North-East Kildare Regional Water Supply Scheme with water supplied from the water treatment plant at Ballymore Eustace. In August 2018, IW completed an upgrade of the plant to increase capacity by improving sludge treatment capacity. However, the Clane LAP notes that *"there are deficiencies within the local network in Clane which require to be addressed in conjunction with development".*

An existing 150mm diameter public uPVC watermain passes the Proposed Development Site on the Brooklands entrance. Refer to the IW map contained in Appendix 7.2.

7.4.2 Characteristics of the Proposed Development

The proposed Development water-main distribution system is indicated on Drawings 18002-303 – 4 to 6. A connection will be made to the existing 150mm watermain at the southwest boundary entrance off Brooklands to service the development. A 150mm diameter spine water main will be provided along the main access route through the proposed Development with a number of 100mm diameter looped water

mains provided along the internal roads branching off the main access route. A connection is made back to the Brooklands residential scheme at the bottom south-west corner of the site.

The connection to the existing 150mm water main will include a metered connection with sluice valve arrangement in accordance with the requirements of IW. A letter of design acceptance from IW is included in Appendix 7.2.

The selected pipe material options for the development will be PE-100.

Individual house will have their own connections to the distribution main via the service connections and boundary boxes. Individual service boundary boxes will be of the type to suit IW and to facilitate domestic meter installation.

Hydrants are provided for fire-fighting at locations to ensure that each dwelling is within the required Building Regulations distance of a hydrant.

The proposed watermain design and layout is in compliance with the IW Code of Practice for Water Infrastructure and the IW Infrastructure Standard Details.

The average daily domestic demand (ADDD) for the proposed Development is approx. 123.5m^3 and an average day/peak week demand of approx. 154.4m^3 has been calculated as outlined in the IW Code of Practice for Water Infrastructure.

Each house will provide 24 hours of cold water storage in the header tank and houses will utilise water saving features for the fittings to reduce water demand.

7.4.3 Potential Impact of the Proposed Development

Construction Phase

Potential effects such as temporary disruption of supply to existing customers of IW could occur during connection works.

During the connection of new mains to existing mains on site there is also a small risk that contamination of the existing supply may occur. The potential impact on the local public water supply network would be short term and imperceptible.

Operational Phase

Irish potable water resources have been shown to be under pressure at times in recent years e.g. dry weather during the summer of 2018. Locally, the capacity of the Ballymore Eustace plant has been recently upgraded and IW has indicated that the proposed Development can be accommodated however the Clane LAP notes that there are deficiencies in the local network. Accordingly, as with all developments, there is an onus to reduce pressure on water supplies and design for sustainability.

7.4.4 Impact Assessment

Construction Phase

The local authority/IW will be contacted and all measures required for introducing a new watermain connection will be adhered to thus avoiding impact on the current water supply.

Testing of the system meter & telemetry system will be completed as required.

Operational Phase

In addition to the inherent measures listed in Section 7.3.2 above, water conservation measures such as dual flush water cisterns and low flow taps will be included in the built design.

The SUDS features proposed for the development include for down pipes from roof surfaces to rainwater harvesting tanks for use in dwellings as grey water.

7.4.5 Avoidance, Remedial and Mitigation Measures

No specific additional measures are proposed.

7.4.6 Predicted Impact of the Proposed Development

Provided that the proposed mitigation measures are implemented, there will be no appreciable impact of the proposed Development during the construction stage on the water supply in the area.

The installation of water saving conservation measures will further reduce the impact of the Proposed Development on water supply in the long term.

7.4.8 Monitoring and Reinstatement

Prior to connection, all new watermains will be tested and cleaned to IW requirements.

Metering arrangements will be provided to IW requirements.

Any damage to existing public mains will be rectified.

7.4.8 Cumulative Impacts

Given the scale of the proposed Development, and the capacity of the water supply to accommodate a development of this nature, it is not likely to give rise to any significant effects cumulatively or, in combination with, other developments in the area.

7.5 Foul Water

7.5.1 The Receiving Environment

IW Schemes

The proposed Development Site falls within the catchment of the Upper Liffey Valley Sewerage Scheme (ULVSS) covering Sallins, Clane, Naas, Prosperous, Johnstown, Kill, Newbridge, Kilcullen, Athgarvan, Carragh and the Curragh. The scheme was conceived for a number of reasons including:

- Increased capacity to facilitate growth and economic development whilst protecting the environment;
- Reduced number of emergency overflows to the River Liffey;
- Reduced risk of flooding in Naas, and,
- Cleaner treated wastewater meeting all regulatory requirements.

To date, IW has upgraded Osberstown Wastewater Treatment Plant (WWTP). At present IW are in the process of upgrading the sewer network. Works including the associated upgrades to Clane sewerage are expected to be fully completed in 2022. Refer to correspondence from IW in Appendix 7.2.

Site Conditions

The proposed Development Site is greenfield and therefore has no foul loading at present. The surrounding developments are served by existing foul systems including two pumping stations located at Abbey Park and Alexandra Walk. Refer to the IW web mapping contained in Appendix 7.2. The Abbey Park pumping station is in the control of the applicant while the Alexandra Walk pumping station is controlled by IW.

7.5.2 Characteristics of the Proposed Development

It is proposed to divide the foul sewerage system for the site into two catchments. Catchment 1 will cover the western part of the proposed Development (181 units) and will discharge by gravity to Abbey Park pumping station via Brooklands. Catchment 2 will cover the eastern part of the proposed Development (remaining 124 units) and will discharge by gravity to Alexandra Walk pumping station. The demand has been calculated by BCA Consulting Engineers as 600l/dwelling/day totalling 183m^3 per day. Refer to Drawings 18002-303-2 and 3.

IW has indicated that capacity currently exists for 230 units with further capacity for the remaining 75 units when the ULVSS is completed. Refer to the correspondence in Appendix 7.2. Due to the phased nature of the development, there will be no impact in terms of pressure on the public network and WWTP as the ULVSS will be completed before the full development is complete.

Individual houses will connect to 150mm or 225mm diameter foul drains via individual 100mm diameter house connections as per the IW Code of Practice for Wastewater Infrastructure.

Foul sewers will be designed in accordance with the Building Regulations and specifically in accordance with the principals and methods set out in the IW Code of Practice, IS EN752 (2008), IS EN12056: Part 2 (2000) and the recommendations of the Greater Dublin Strategic Drainage Study, (GDSDS).

7.5.3 Potential Impact of the Proposed Development

Construction Phase

Potential damage to existing sewerage network during connection.

Operational Phase

- Additional pressure on the current foul sewerage system leading to overload.
- Ingress of groundwater to sewerage system causing unnecessary increases in loading to the public sewerage system and Osberstown WWTP.

7.4.4 Impact Assessment

The local authority/IW will be contacted and all measures required for introducing a new foul main connection will be adhered to thus avoiding impact on the existing pipeline system.
As noted above, the development will be phased and will not be fully complete until post completion of the ULVSS. Accordingly, there will be no additional pressure on the existing network.
Measures to conserve water equally serve to reduce foul sewage generation and unnecessary use of treatment capacity.

All onsite sewers will be tested and surveyed prior to connection to the public sewer to prevent any possibility of ingress of ground water.

Accordingly, it is not anticipated that any impact on the public foul sewerage system will occur as a result of the proposed Development.

7.5.5 Avoidance, Remedial and Mitigation Measures

No specific additional measures are proposed.

7.5.6 Predicted Impact of the Proposed Development

Provided that the proposed mitigation measures are implemented, there will be no appreciable impact of the proposed Development on the foul sewerage system in the area.

7.5.7 Monitoring and Reinstatement

As detailed above, all new foul sewers will be tested and surveyed prior to connection.

7.5.8 Cumulative Impacts

Given the scale of the proposed Development, and the envisaged capacity of the foul sewerage system to accommodate a development of this nature, it is not likely to give rise to any significant effects cumulatively or, in combination with, other developments in the area.

8.0 NOISE AND VIBRATION

8.1 Introduction

This chapter identifies and assesses the potential noise and vibration impacts and related potential effects arising from both the construction and operational phases of the proposed Development at Capdoo Commons Clane.

Key issues to be addressed in this chapter include identification and assessment of potential temporary/short-term construction noise and vibration impacts arising from the construction and development phase and potential long-term noise impact at nearby Noise Sensitive Locations (NSLs) arising from increased traffic on the surrounding road network. The potential for long term impact and effects on future residents has also been considered taking account of the existing ambient sound environment and future potential noise sources.

8.1.1 Competent Expertise

This assessment has been prepared by Ms. Siobhan Maher whose qualifications include a B.Sc. in Analytical Science, M.Tech. in Environmental Management and a post graduate Diploma in Acoustics and Noise Control Engineering. Siobhan is a full Member of the Institute of Acoustics (MIOA) since 2003 and also a Member of the Association of Acoustic Consultants Ireland (AACI).

Ms. Siobhan Maher is the Managing Director of Redkite Environmental with over 20 years of experience providing environmental consultancy and environmental assessment services to business, industry and public sectors. In the area of acoustics, she has experience in noise and vibration impact assessment, building acoustics (design and standard assessment), environmental noise monitoring and prediction modelling and occupational noise assessment.

8.2 Methodology

8.2.1 Characterisation of the Receiving Environment

The receiving ambient sound environment or existing soundscape has been characterised by field survey and desk-based study.

Site visits and surveys were completed on the 15th, 23rd, 24th and 25th July 2019 at three Noise Monitoring Points (NMPs) during day (07.00 – 19.00hrs), evening (19.00 – 23.00 hrs) and night-time (23.00 – 07.00 hrs) periods. The measurement methodology followed was in accordance with the recommendations of the following:

- International Standards Organisation Document: ISO 1996 Acoustics – Description, Measurement and Assessment of Environmental Noise, Part 1, Basic Quantities and Assessment Procedures (2016) and Part 2 Determination of Environmental Noise Levels (2017), and,
- The EPA Guidance Note for Noise: License Applications, Surveys and Assessments in Relation to Scheduled Activities, (NG4), revised January 2016.

Ambient noise monitoring was undertaken at the locations as illustrated and described in Figure 8.1 and Table 8.1 overleaf. The locations were chosen to be representative of Noise Sensitive Locations (NSLs) and also to evaluate the typical existing noise sources affecting the proposed Development Site.

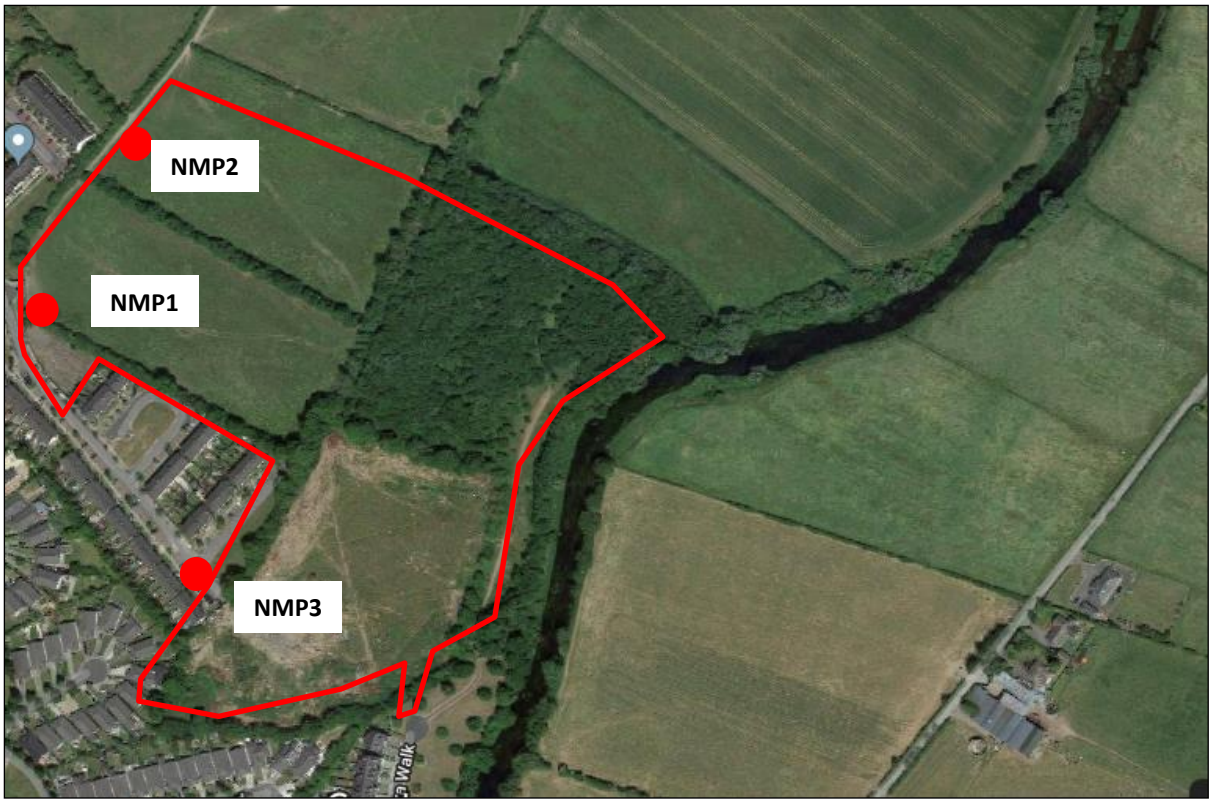

Figure 8.1 Noise monitoring locations.

Location	Grid Ref.	Description
NMP1	288251E;227915N	Western site boundary with Brooklands development.
NMP2*	288317E;228015N	Northwestern site boundary. Overlooked by Brooklands apartment blocks to west.
NMP3	288382E;227724N	Southwestern site boundary. In Brooklands development.

Table 8.1 Noise monitoring points (*Unattended measurements on the 24th/25th July were made at NMP2).

The Photolog in Appendix 8.1 illustrates the ambient monitoring locations.

Ambient monitoring was conducted during the day, evening and night - time periods using both attended and un-attended meters. An unattended meter was set up on the 24th/25th July at NMP2 to collect data during the early hours of the morning. The data was directly collected and/or post-analysed from continuous monitoring into 15-minute measurement intervals. The attended meters were set to continuously log L_{Aeq}, L_{A90}, L_{A10}, L_{Amax} and L_{Amin} to assist in later post processing and analysis.

During the attended measurements on the 23rd/24th July 2019, survey personnel noted all primary noise sources contributing to the ambient sound environment. Detailed field notes were recorded during the survey.

Overall weather conditions prevailing during the survey were suitable for noise monitoring. The weather was warm with temperatures up to 25^{0}C during the daytime on 23rd July 2019 dropping to 16^{0}C during the night-time period. Windspeeds recorded on the 23rd and 25th July varied with an average windspeed of 3 m/sec mainly from the southwest. Occasional gusts occurred at times up to 6 m/sec. Slightly breezier conditions prevailed on the afternoon of the 24th July through to the 25th July 2019 with an average windspeed of 5 m/sec. No rainfall occurred. The effects of weather conditions and any associated uncertainty are discussed under Section 8.3.
Sound measurement was carried out using three Type 1 Sound Level Meters and associated hardware (calibrators and tripods, outdoor kits etc) and software. The meters were placed in open areas >3.5m

from reflecting surfaces and a minimum of 1.2m above ground level. The meters were calibrated before and after use. The observed drift during measurement was <0.1 dB. The sound levels were measured using the A-weighted network, and a fast sampling interval. Un-weighted 1/3 octave spectra were also logged throughout on the attended meters. Wind speed was measured using a portable anemometer. Further details of the monitoring equipment used are set out in Table 8.2 below.

Instrument Type	Manufacturer	Model Number	Serial Number
Sound Level Meter	NTi	XL2	A2A-08898-E0
Microphone	NTi	MA220	5062
Acoustical Calibrator	NTi/Larson Davis	CAL 200	11728
Sound Level Meter	Cirrus Research plc	CR:171B	G056143
Acoustic Calibrator	Cirrus Research plc	CR:515	55191
Sound Level Meter	Bruel & Kjaer	2238	2590900

Table 8.2 Monitoring equipment.

The meters and calibrators are all externally calibrated in accordance with recommended standards. Appendix 8.2 contains external calibration certs for the equipment used.

8.2.2 Prediction of Impacts

ISO 9613.-2 – 1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation was used as guidance to predict impacts associated with the Proposed Development.

8.2.3 Criteria for Assessment of Noise Impact and Determination of Significance

The following criteria have been used, where appropriate, to assess noise impacts described in this report:

Criteria for Extent of Noise Impact (dB)	Noise Impact Magnitude	Magnitude Rating
>10	Severe	Very high
5 to 10	Substantial	High
3 to 5	Moderate	Medium
1 to 3	Slight	Low
<1	Negligible	Very Low

Table 8.3 Criteria for noise impact assessment.

The above table describes the noise impact i.e. the change in noise levels before and after implementation of a Proposed Development. The table does not however describe whether the change in noise levels is significant. Relying solely on change in noise level is not appropriate because it risks ignoring the context of the noise change. The actual effect on NSLs and hence significance takes account of other relevant factors such as receptor sensitivity, time of day of occurrence, averaging periods, nature of source, frequency spectra, frequency of occurrence and absolute level. The linking of magnitude of impact to likely effects and significance is described in Table 8.4 below. The above assessment procedure is in line with recently published methodologies set out in BS4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound and Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment, 2014.

Impact Magnitude	Receptor Perception (adverse)	Significance
Negligible	No discernible effect	Not significant
Slight	Non-intrusive. Noise impact can be heard but no change in behavior or perceived change in quality of life.	Less likely to be significant

Moderate	Intrusive. Noise Impact can be heard and causes change in behavior. Affects the character of the area and there is a perceived change in quality of life.	*(greater justification needed, based on impact magnitude and receptor sensitivity to justify a significant effect)* ↓ *(greater justification needed, based on impact magnitude and receptor sensitivity to justify a non-significant effect)* More likely to be significant
Substantial	Disruptive. Causes material change in behaviour and/or attitude. Avoiding certain activities during periods of intrusion. Quality of life diminished due to change in character of the area.	
Severe	Physically harmful (e.g. sleep disturbance, cardio-vascular and psychological effects)	Significant

Table 8.4 Significance of effects.

The EPA draft document entitled Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, 2017 also contains general guidance on the assessing of environmental effects in terms of quality, significance, duration, magnitude and type. This document has also been considered in defining noise and vibration impacts.

8.2.4 Definitions

The following definitions apply in this chapter:

L_{Aeq} is the A – weighted equivalent continuous sound level – the sound level of a steady sound having the same energy as a fluctuating sound over a specified measurement period.

L_{A10} is the A-weighted noise level which is exceeded for 10% of the specified measurement period. This gives an indication of the upper limit of fluctuating noise such as that from road traffic.

L_{A90} is the A-weighted noise level exceeded for 90% of the measurement period and is useful in providing an indication of the background noise level experienced over the measurement period.

L_{AFmax} is the maximum A-weighted noise level measured during a cycle with a fast time weighting.

L_{AFmin} is the minimum A-weighted noise level measured during a cycle with a fast time weighting.

L_{day} Day equivalent level**:** A-weighted, Leq. Sound Level, measured over the 12-hour period 07.00 - 19.00 hours

L_{den} Day-evening-night level. It is a descriptor of noise level based on energy equivalent noise level (Leq) over a whole day with a penalty of 10 dB(A) for night-time noise (22.00-7.00) and an additional penalty of 5 dB(A) for evening noise (i.e. 19.00-23.00).
L_{night} Night equivalent level**:** Leq. A-weighted, Sound Level, measured overnight 23.00 - 0700 hours.

The “A” suffix denotes sound levels that have been “A-weighted” in order to account for the non-linear nature of human hearing to sounds of different frequencies.

All sound levels in this report are expressed in terms of decibels (dB) relative to 2x10-5 Pa.

8.3 Receiving Environment

8.3.1 Locational Context

The proposed Development Site is located approximately 750m to the east/northeast of Clane Main Street (R407) and approximately 250m south of the R403 (Dublin Road). It is currently undeveloped and in agricultural use. It is bounded to the west/southwest by the Brooklands development comprising two-storey houses and a number of apartment blocks which overlook the site (Refer to Photo 2, Appendix 8.1). Part of the Abbey Park development and Alexandra Walk adjoin the southern site boundary. The River Liffey lies along the eastern boundary. The northern portion of the site adjoins lands in agricultural use and in the ownership of the applicant. Lands further north and east of the Liffey are also in agricultural use. The Sallins rail line lies approximately 4km to the southeast. The M7 at Naas lies some 6km south while the M4 lies nearly 10km to the north.

The nearest Noise Sensitive Locations (NSLs) to the proposed Development Site are dwellings in the adjoining Brooklands and Abbey Park Estates. The proposed Development Site rises slightly from the Liffey towards the centre of the site and then drops back towards the Brooklands development. Ground levels range from approx. 64 - 67mOD. The proposed Development Site is currently bounded by a mix of walls, hedgerows and palisade fencing.

Typical neighbourhood noise sources characterise the proposed Development Site and nearby NSLs. The soundscape is also characterised by continuously low but audible distant transportation sources.

8.3.2 Ambient Sound Survey

The summary findings of the ambient sound survey at three boundary locations NMP1, NMP2 and NMP3 are presented in Tables 8.5, 8.6 and 8.7 overleaf. Appendix 8.3 contains summary sheets print-outs from the noise meters detailing logged noise levels, calibration times and 1/3 octave band spectra.

No.	Time	LAeq,15 mins	LA10,15 mins	LA90,15 mins	LAFmax	Description of Ambient Sound Environment
23rd July Daytime (07.00 – 19.00hrs)						
1.	14.15	44	49	39	59	Gentle breeze variable up to 2.2 m/sec from southwest. Location quiet with typical neighbourhood sounds audible including children playing and occasional passing cars on the estate road. Low-flying small aircraft frequently passed by overhead. Grass-cutting occurred intermittently at approx. 15.00 hrs in the Brooklands apartment complex grounds. This caused on increase in noise levels. The lawnmower was still operational at the end of the daytime survey. Distant continuous traffic was audible at all times during the survey and contributed to the LA90,t values recorded.
2.	14.30	44	48	39	59	
3.	15.00	43	45	39	58	
4.	15.15	49	45	36	70	
5.	15.30	44	46	36	61	
6.	15.45	49	52	38	64	
7.	16.00	48	52	39	65	
23rd July Evening time (19.00 – 23.00 hrs)						
1.	22.15	40	39	31	64	Quiet. Windspeeds had reduced compared to daytime and conditions were calm during the evening time survey. Occasional light breezes (<2m/sec) arose from the south/southwest. The predominant noise sources were distant transportation sources emanating from the eastern and southern directions. Some children were playing in the adjoining estate. Occasional birds tweeting and muffled car doors closing.
2.	22.30	37	41	32	57	
3.	22.45	36	39	32	47	
23rd July Night-time (23.00 – 07.00 hrs)						
1.	23.00	36	38	33	46	Quiet with distant transportation sources predominant however an alarm was going off intermittently at approx. 23.00 hrs. until approx. 23.20 hrs. This increased the LAeq,t during that period. Wind speeds started to increase to 2.4 m/sec from the southwest at approx. 23.45 hrs.
2.	**23.15**	**34**	**36**	**31**	**47**	
3.	**23.30**	**35**	**38**	**31**	**49**	
4.	**23.45**	**34**	**36**	**30**	**57**	

Table 8.5 Day, evening & night-time levels – NMP1.

No.	Time	$L_{Aeq,15mins}$	$L_{A10,15\ mins}$	$L_{A90,15mins}$	L_{AFmax}	Description of Ambient Sound Environment
23rd July Daytime (07.00 – 19.00hrs)						
1.	14.30	43	45	39	59	This location was more influenced by adjoining ground maintenance activities in Brooklands apartment complex than NMP1 as evidenced by the higher values recorded during 15.00 – 15.15 as the lawnmower was close by to the boundary point at NMP2 during this time (Refer to Appendix 8.3 where logged data indicates the increase). Other sources include background transportation sources.
2.	14.45	47	51	40	64	
3.	15.00	56	62	40	62	
4.	15.15	54	59	39	69	
5.	15.30	47	52	39	61	
6.	15.45	46	49	40	65	
23rd July Evening time (19.00 – 23.00 hrs)						
1.	22.15	38	40	33	52	Quiet location during the evening with calm conditions. Same sources as NMP1.
2.	22.30	37	40	34	49	
3.	22.45	37	39	34	50	
23rd July Night-time (23.00 – 07.00 hrs)						
1.	23.00	37	39	32	52	Similar sources as per NMP1. Some people talking in the car-park of the adjoining apartment complex close to NMP2.
2.	23.15	36	38	31	52	
3.	23.30	37	39	32	54	
4.	23.45	36	39	31	53	

Table 8.6 Day, evening & night-time; levels – NMP2.

No.	Time	$L_{Aeq,15mins}$	$L_{A10,15\ mins}$	$L_{A90,15mins}$	L_{AFmax}	Description of Ambient Sound Environment
23rd July Daytime (07.00 – 19.00hrs)						
1.	14.30	43	45	39	59	This location was more influenced by adjoining ground maintenance activities in Brooklands apartment complex than NMP1 as evidenced by the higher values recorded during 15.00 – 15.15 as the lawnmower was close by to the boundary point at NMP2 during this time (Refer to Appendix 8.3 where logged data indicates the increase). Other sources include background transportation sources.
2.	14.45	47	51	40	64	
3.	15.00	56	62	40	62	
4.	15.15	54	59	39	69	
5.	15.30	47	52	39	61	
6.	15.45	46	49	40	65	
23rd July Evening time (19.00 – 23.00 hrs)						
1.	22.15	38	40	33	52	Quiet location during the evening with calm conditions. Same sources as NMP1.
2.	22.30	37	40	34	49	
3.	22.45	37	39	34	50	
23rd July Night-time (23.00 – 07.00 hrs)						
1.	23.00	37	39	32	52	Similar sources as per NMP1. Some people talking in the car-park of the adjoining apartment complex close to NMP2.
2.	23.15	36	38	31	52	
3.	23.30	37	39	32	54	
4.	23.45	36	39	31	53	

Table 8.6 Day, evening & night-time; levels – NMP2.

No.	Time	$L_{Aeq,15mins}$	$L_{A10,15\ mins}$	$L_{A90,15mins}$	L_{AFmax}	Description of Ambient Sound Environment
23rd July Daytime (07.00 – 19.00hrs)						
1.	17.30	43	45	36	75	Windspeeds variable up to 1.5m/sec max. This location was within the Brooklands development and located at a cul de sac. The estate was busier at this time of the day compared to NMP1 as residents were arriving home from work. Accordingly, there was more activity than earlier in the day (barbeques, some muffled music) although there were no lawnmowers operating. Typical neighbourhood sources affected the $L_{Aeq,t}$ values recorded with distant traffic as the predominant continuous background source. Overhead planes and some muffled power tools operating in the estate to the south were also audible. L_{AFmax} values are from cars parking. An occasional bang similar to a bird scarer was audible on occasion from the northeast direction.
2.	17.45	49	52	37	72	
3.	18.00	47	51	37	68	
4.	18.15	40	42	36	56	
5.	18.30	44	47	37	63	
6.	18.45	42	45	37	60	
23rd July Evening time (19.00 – 23.00 hrs)						
1.	19.00	46	46	37	72	As above.
2.	19.15	43	46	36	60	
24th July Night-time (23.00 – 07.00 hrs)						
1.	00.45	33	36	27	46	Windspeeds were low at 1.1 m/sec at the start of the survey however there were some gusts up to 6 m/sec affecting the final measurement as a low cloud passed overhead. This caused rustling of leaves which increased noise levels during #3. Otherwise, distant traffic was the only source audible during the survey.
2.	01.00	36	40	29	46	
3.	01.15	39	42	32	55	

Table 8.7 Day, evening & night-time; levels – NMP3.

In addition to the above, an unattended meter recorded sound levels at NMP2 during a 17 -hour period from approx. 16.00 hrs on the 23rd July through to 09.00 hrs on 24th July. Noise levels during this period are set out below:

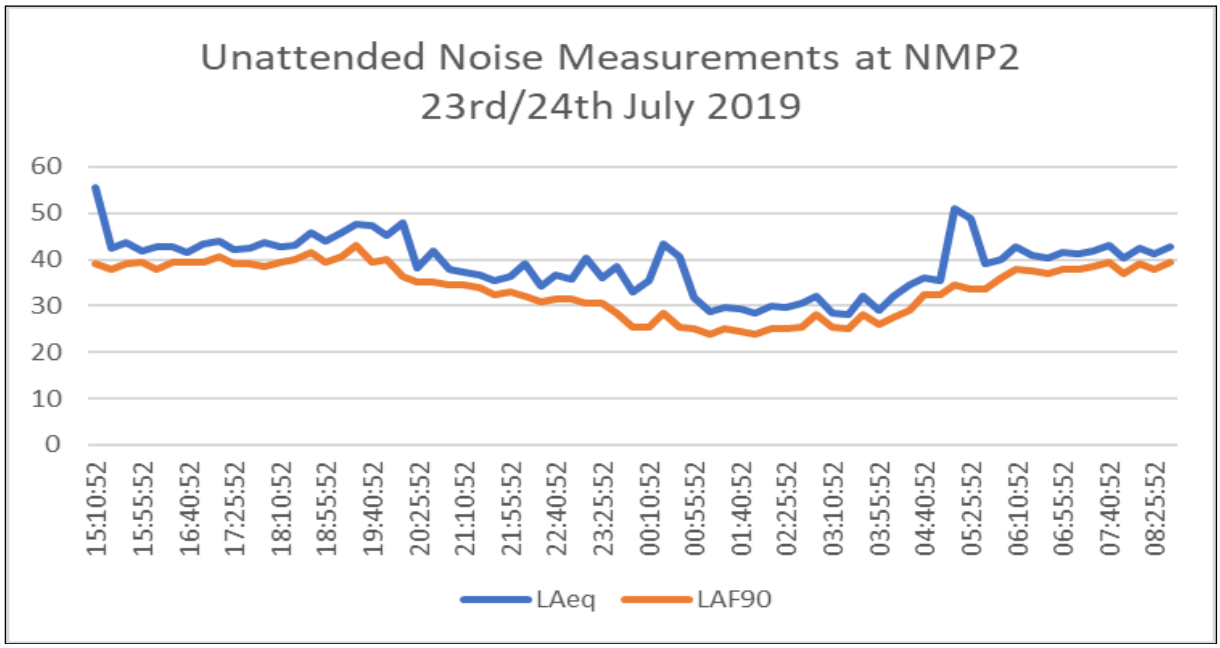

Figure 8.2 Unattended noise measurement.

The average $L_{Aeq,15min}$ and $L_{A,90,15\ min}$ values recorded over the entire time period were 39 dB and 34 dB respectively. As expected, the quietest period was between 01.00 - 04.00 hrs. The dawn chorus started at approx. 05.00 hrs and also distant traffic sources would be expected to start increasing at this time also. Windspeeds started to increase at approx. 06.00 hrs on the 24th July however the graph above represents an expected pattern for the site context. Higher than expected L_{Amax} values (2 No.) occurred during measurements occurring between 00.25 and 00.40 hrs on the 24th July resulting in the peaks in the graph above. It is possible that some disturbance from animals may have occurred around this time or there may have been some activity in the car-park of the adjoining Brooklands apartment complex.

8.3.3 Desk-Based Study

Kildare County Council has recently published the draft Round 3 Kildare County Council Noise Action Plan 2019 -2023. Related traffic noise mapping is available on the EPA's website **https://gis.epa.ie/EPAMaps/** and includes for the R403 and R407 at Clane. Figures 8.3 and 8.4 overleaf re-produce the Round 3 road noise mapping in the vicinity of the site. As expected, the proposed Development Site is not within the zone of influence of the roads. Clane is not identified in the draft Plan as one of the population centres in Kildare potentially affected by rail noise.

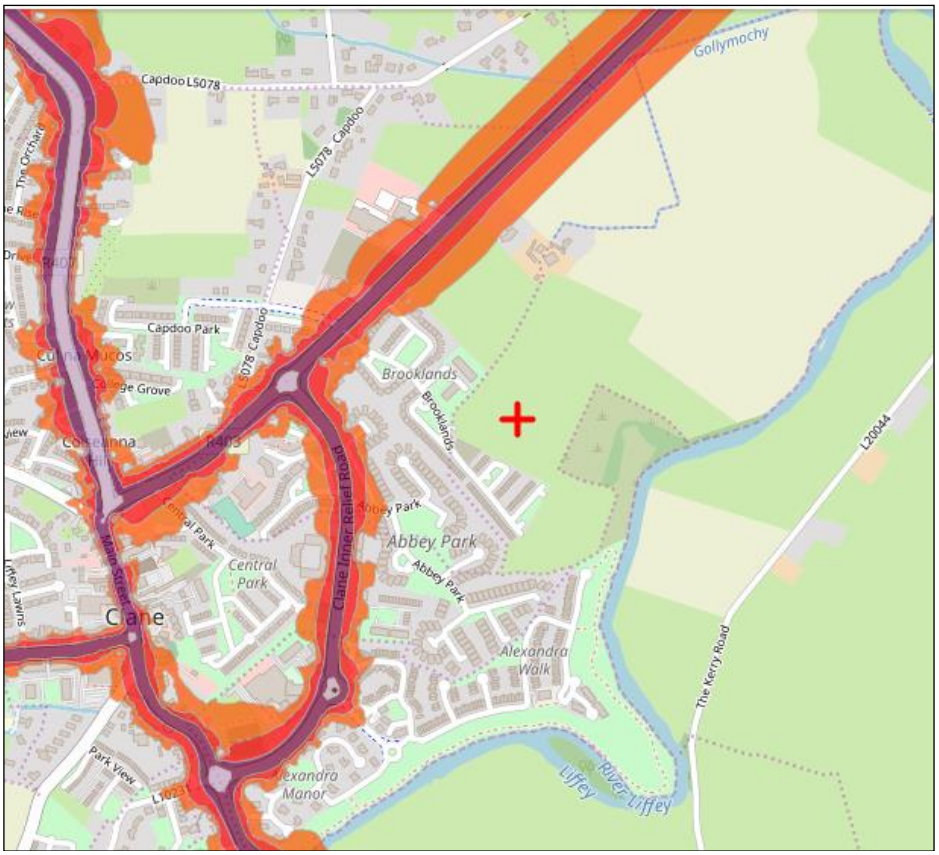

Figure 8.3 Latest round 3 road noise mapping L_{den} (Source: https://gis.epa.ie/EPAMaps/).

Figure 8.4 Latest round 3 road noise mapping L_{night} (Source: https://gis.epa.ie/EPAMaps/).

8.3.4 Ambient Soundscape Summary

The proposed Development Site and immediate surrounding existing residential development are not "quiet areas"[1] or "areas of low background noise"[2] as strictly defined in the EPA Guidelines, NG4[3]. However, the proposed Development Site is on the outskirts of Clane and is considered to be in a quiet suburban/rural area.

The UK ProPG: Planning & Noise, New Residential Development, May 2017[4] outlines a systematic risk based 2 stage approach for evaluating noise exposure on prospective sites for residential development. Stage 1 comprises an initial noise risk assessment of sites proposed for residential development considering either measured and/or predicted noise levels. A site is then characterised as negligible to high risk in terms of noise exposure of future residents. Based on the survey completed, the proposed Development Site is determined to be negligible in terms of noise risk for new residential development.

8.3.5 Vibration

No existing vibration sources were noted during the site surveys.

8.4 Characteristics of the Proposed Development

The proposed Development comprises 305 residential units, a creche and associated infrastructure including internal roads, footpaths and foul, surface water and water supply networks. A linear park will be developed along the line of the River Liffey. The residential units will be mixed comprising apartments, maisonettes, terraced and semi-detached units. The apartment blocks are mainly located along the western site boundary adjoining the Brooklands apartment complex with some further blocks along the northern boundary. The creche will be located close to NMP1. There are no other commercial/retail units associated with the proposed development.

Long term access to the proposed Development will be via the existing R403/Brooklands/Capdoo Park crossroads and via the existing R403/Alexandra Walk/The Avenue roundabout. Drawing 18002-301, illustrating the proposed Development layout shows the access points into the development in the vicinity of NMP1 and at Alexandra Walk to the east of NMP3.

The site development and construction phase for the proposed Development is expected to take place over a 5-year period with the development expected to be fully completed in 2027. The development will be built in 4 phases (A-D) including site infrastructure for each phase. The linear park will be developed during Phase A of development. The site development and construction phases will typically include for the use of heavy earthmoving equipment during the initial phases and other equipment such as plant tools, generators, con saws and drills during the building phases. Jack-hammers and rock-breakers are not expected to be used due to ground conditions present. Piling may be required. Further, detail is provided in the assessment in Section 8.6 below.

8.5 Potential Impact of the Proposed Development

The site development and construction phases can potentially give rise to temporary significant noise and vibration impact and effects through the use of mobile and non-mobile heavy machinery and equipment.

[1] These are very quiet rural areas at least 3km from urban areas with a population >1,000 people and at least 7.5km from any motorway or dual carriageway. Other criteria also apply. Refer to Section 4 of NG4.
[2] Average Daytime Background Noise Level ≤40dB L_{AF90}, and,
Average Evening Background Noise Level ≤35 dB L_{AF90}, and,
Average Night-time Background Noise Level ≤30dB L_{AF90}.
[3] Guidance Note for Noise: Licence Applications, Surveys and Assessment in Relation to Scheduled Activities, EPA, January 2016 (NG4)
[4] This document was prepared by a working group comprising members of the UK Association of Noise Consultants (ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH). Although not a government document, since its adoption, it has been generally considered as a best practice guidance for assessing inward noise risk for new residential development.

In the long term, the noise arising from the development will be from typical neighbourhood activities and levels are expected to be similar to the existing noise levels recorded at NMP1 and NMP3 during the baseline survey. Accordingly, the long-term impact is expected to be neutral on the existing ambient sound environment. Additional traffic at the two access junctions and routes (Brooklands Spine Road and Alexandra Walk) into the proposed Development can potentially give rise to traffic noise impact at existing NSLs in the long term. This is assessed under Section 8.6 below. There are no proposed retail outlets. Accordingly, there are no potential commercial sources such as extraction fans or refrigerator units that could potentially give rise to noise impact in the long term.

8.5.1 Applicable Noise Criteria

Construction Phase

There is no definitive published Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. BS5228:2009 + A1:2014lists applicable noise level thresholds, depending upon existing ambient levels, as described in Table 8.8 below. This table is based upon report E3.2, Table E.1 of BS5228:2009 + A1:2014 Part 1.

Assessment category and threshold value period (L_{Aeq})	**Threshold value, in decibels (dB)**		
	Category A	**Category B**	**Category C**
Night-time 23:00-07:00	45	50	55
Evening and Weekends	55	60	65
Daytime - 07:00-19:00 & Saturday - 07:00-13:00	65	70	75
NOTE 1: A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level. NOTE 2: If the ambient noise level exceeds the threshold values given, in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3dB due to construction activity. NOTE 3 Applied to residential receptors only.			
A) Cat A: Threshold values to use when ambient noise levels (rounded to nearest 5dB) are less than these values B) Cat B: Threshold values to use when ambient noise levels (rounded to the nearest 5dB) are the same as Cat A values C) Cat C: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than Cat A values D) 19:00-23:00 weekdays, 13:00-23:00 Saturday and 07:00-23:00 Sunday is deemed 'evening and weekend' period.			

Table 8.8 Threshold of significant effect at dwellings.

Generally, Category A threshold values can be applied based on the ambient sound levels recorded during the baseline survey.

The County Kildare Draft 3rd Noise Action Plan 2019 – 2023 notes that the following criteria, set out in Table 8.9 overleaf, are applied during the construction of infrastructure projects:

Day	**Working Hours**	**Level dB (L_{Aeq})**	**Level dB (L_{Amax})**
Mon-Fri	07.00 – 19.00	70	80
Mon-Fri	19.00 – 22.00	60	65
Saturday	08.00 – 16.30	65	75
Sundays & Bank Holidays	08.00 – 16.30	60	65

Table 8.9 Recommended Criteria Set out in the draft Noise Action Plan **(**Source: Noise Levels are the maximum permissible noise levels at the façade of dwellings during construction as indicated in the Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004.).[5]

[5] According to the County Kildare County draft 3rd Noise Action Plan, Transport Infrastructure Ireland (TII) commenced work on producing new standards in 2017.

Overall, it is considered that the limits presented in Table 8.8 are more applicable to the proposed Development Site based on the existing baseline sound levels and the fact that the guidance in the draft Noise Action Plan is directed at line type infrastructure projects such as road schemes.

Operational Phase

Existing NSLs

In terms of impact on existing NSLs, there are no specific criteria considered strictly necessary to describe with regard to the long-term development phase due to the nature of the proposed development. As noted earlier under Section 8.5, noise sources associated with the development are likely to be typical neighbourhood sources and therefore unlikely to impact on existing ambient sound levels at existing NSLs. The effect is expected to be neutral.

Additional traffic will however be generated on the surrounding road network as a result of the development. In October 2018, the World Health Organisation (WHO) published new Environmental Noise Guidelines for the European Region. The new Guidelines deal with individual types of noise such as road, rail, aircraft, wind turbine and leisure noise. The following Guidelines are set for road traffic noise:

> *For average noise exposure, the GDG strongly recommends reducing noise levels produced by road traffic below 53 decibels (dB) L_{den}, as road traffic noise above this level is associated with adverse health effects.*
>
> *For night noise exposure, the GDG strongly recommends reducing noise levels produced by road traffic during night time below 45 dB L_{night}, as night-time road traffic noise above this level is associated with adverse effects on sleep.*
>
> *To reduce health effects, the GDG strongly recommends that policy-makers implement suitable measures to reduce noise exposure from road traffic in the population exposed to levels above the guideline values for average and night noise exposure. For specific interventions, the GDG recommends reducing noise both at the source and on the route between the source and the affected population by changes in infrastructure.*

Future Residents

As noted under Section 8.3, the proposed Development Site is quiet and considered to have a negligible risk in terms of noise exposure of future residents.

Notwithstanding, this, appropriate guidance in relation to noise intrusion in residential and other buildings is also contained within BS8233:2014 – *Guidance on Sound Insulation and Noise Reduction for Buildings.* This British standard sets out recommended noise limits for indoor ambient noise levels and takes account of guidelines issued by bodies such as the WHO. Details taken from the standard are presented in Table 8.10 below.

Criteria	**Typical Situation**	**Design Range $L_{Aeq,\ T}$**	
		07.00-23.00	**23.00 -07.00**
Resting	Living Room	35 $L_{Aeq,16hr}$	-
Dining	Dining Room	40 $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 $L_{Aeq,16hr}$	30 $L_{Aeq,8hr}$

Table 8.10 Recommended indoor ambient noise levels (*Source: BS8233:2014).*

In addition, BS8233:2014 states that "*the acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 -55 dB $L_{Aeq,16hr.}$"*

ProPG goes further to extend the advice contained within BS8233:2014 to include:

> *Whether or not external amenity spaces are an intrinsic part of the overall design, consideration of the need to provide access to a quiet or relatively quiet external amenity space forms part of a good acoustic design process.*

8.5.2 Vibration Criteria

Construction Phase

Vibration impacts can typically potentially occur during the construction phase of development through the use of equipment such as rock breakers or piling.

Guidance relevant to the protection of building structures 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: 2009+A1 2014: Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration.

Both standards contain the same guidance relating to building damage criteria. The standards note that the risk of cosmetic damage to residential buildings starts at a Peak Particle Velocity (PPV) of 15mm/s at 4Hz rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above for unreinforced or light framed structures. The standard also notes that below 12.5mm/s PPV the risk of damage tends to zero.

Humans are particularly sensitive to vibration stimuli and responses typically occur well below the order of magnitude for building damage.

BS5228-2 provides the following range of vibration values and associated potential effects on humans:

Vibration Level mm/sec PPV	Effect
0.14	Vibration might just be perceptible in the most sensitive in the most sensitive situations for most vibration frequencies.
0.3	Vibration might just be perceptible in residential environments.
1	A vibration level of this magnitude is likely to cause complaint.

Table 8.11 Vibration criteria – human beings.

The above effects may not be noted for infrequent or un-sustained levels. *BS6472:2008 Guide to evaluation of human exposure to vibration in buildings: Part 1: Vibration sources other than blasting* provides guidance in terms of vibration dose value (VDV) where time varying exposure is likely.

Operational Phase

There are no significant vibrational sources expected to be operational once the development is completed.

8.6 Impact Assessments

Both the construction and operational phases of the proposed Development are assessed below.

8.6.1 Construction Phase

The construction phase will involve works such as site preparation works, construction of buildings, road surfacing and landscaping etc., all of which will result in the use of noisy machinery as well as the movement of Heavy Goods Vehicles (HGVs) on and off the site. It is anticipated that the proposed Development will be constructed in phases over a 5-year period in total.

The construction phase for the proposed Development has the potential to increase noise levels and impact on the existing ambient noise environment due to the proximity of the works to the existing NSLs along the site boundary.

It is difficult to predict with absolute certainty the noise impact associated with the construction phase as the construction works will be subject to a tendering phase. In this regard, the following factors are relevant:

- The sound power ratings used for each piece of equipment in the assessment, as taken from BS5228, may vary from the actual equipment used on site (Annex C of the Code of Practice outlines various noise levels for each type of equipment);
- It is not possible to outline for definite the type of equipment which will be in use, or the duration of time each piece of equipment will be in use; and,
- Noise emissions from construction vary in intensity and character but also in location and over time.

Ground conditions are also a factor to consider in predicting construction phase impacts. Test pits completed by IGSL indicate that the underlying soil and subsoils to depths of 2.0m bgl is mainly brown sandy clay with occasional gravel. EPA mapping for the site indicates that the site subsoil is limestone sands and gravels with depths to bedrock >10m. Accordingly, it is highly unlikely that rock-breaking will be required. Piling may be required for the apartment blocks using reinforced pre-cast concrete driven piles or foundations may be achieved by the installation of stone columns by vibro-replacement.

The following equipment is likely to be used:

- Tracked excavator and dump trucks for site development works and building foundations.
- Pumps for dewatering if required.
- Tipper lorries and vibrating rollers for road construction, concrete lorries and flat-bed lorries for site deliveries.
- Mini excavators for house services and landscaping works.
- Telehandler to service trades during superstructure construction.
- Mobile crane for erection of modular timber / steel frame houses and installation of precast concrete floor slabs and stairs.
- Diesel mixer during blockwork and plastering works.
- Small generators and other site tools at times.

Based on the above general details, Table 8.12 below details typical noise sources that may be in operation at different times during the construction phase with predictions based on distance attenuation alone at 50 and 100 meters.

Activity	**Activity equivalent continuous sound pressure level $L_{Aeq,T}$ @ 10m**	**Activity equivalent continuous sound pressure level $L_{Aeq,T}$ @ 50m**	**Activity equivalent continuous sound pressure level $L_{Aeq,T}$ @ 100m**
Site Preparation *Potential Equipment to be Used for Ground Excavation, Foundations, Filling and Trenching*			
Piling – vibratory piling rig	88	74	68
Tracked Excavator	83	69	63
Tipper lorry/Placing of rock fill	85	71	65
Likely Equipment to be used for Tipping/Spreading and Levelling of Ground:			

Dump Truck	82	68	62
Wheeled Excavator/loader	76	62	56
Dozer	81	67	61
Roller	78	64	58
Compactor	78	64	58
Building Construction			
Likely Equipment to be Used:			
Truck mixer (discharging)	67	53	47
Pumping concrete - truck mixer	81	67	61
Placing concrete and compaction – (combined truck mixer, tracked crane, poker vibrator)	86	72	66
Other Potential Noise Sources in Operation at different times:			
Diesel Driven Generator	82	68	62
Compressor	81	67	61
Electric percussion drills	78	64	58
Hand-held petrol driven disc cutter	84	70	64
Scaffold Poles and Clips	80	66	60
Site Fork Lift Trucks (idling)	77	63	57
Diesel Hoist	76	62	56
Dumper	82	68	62
Tracked Crane	86	72	66
Lorry	85	71	65
Paving Works/ Landscaping			
Tipper lorry	85	71	65
Roller	78	64	58
Grader	84	70	64

Table 8.12 Construction noise sources (Noise Sources: BS5228-1:2009 +A1:2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites: Part 1: Noise).

As can be noted from Table 8.12 above, noise levels associated with the site development and construction phase will reduce as works move away from the boundaries however, some works will occur close to existing NSLs where very little attenuation due to distance alone can be provided. There is currently little in the way of screening existing NSLs from the construction site. The existing apartment block NSLs will overlook the site. However, as each phase is developed, the new buildings will provide screening to existing NSLs from construction noise. It is likely that residents of the new development will expect a certain level of construction noise disturbance on a new development site.

It is also important to note that the predictions in Table 8.12 do not specify the time over which each noise source will be active i.e. the predictions are expressed as $L_{Aeq,t}$ (continuous) as opposed to $L_{Aeq,}$ 15mins or 30mins or 1 hour as the case may be. So, if for example a dump truck (e.g. $L_{Aeq,t}$ is predicted to be 68dB at 50m) was active over 30 minutes in a 1 hour assessment period then the $L_{Aeq,1hr}$ @50m would reduce to 65dB using the following equation:

Eqn 1: $L_{Aeq,\ 1hr} = 10 \log ((t1 \times 10^{L1/10} + t2 \times 10^{L2/10})/T)$

Where: t1 is 5x60secs
t2 is 55 x 60 secs
L1 is 68dB
L2 is 46dB (average daytime ambient level)
T is 60x60secs

It is also highly unlikely that all sources will be active for each activity at any given time. Four dump trucks operating together at 50m from an NSL over 30 mins in an hour will give rise to an $L_{Aeq,1hr}$ value of 71dB without considering screening or ground attenuation.

Notwithstanding the above mitigating factors, it is likely that site development and construction noise will, at times, result in elevated noise levels above accepted criteria and above existing background levels within the gardens and at the facades of the nearest NSLs. Taking account of existing ambient sound levels, the effect is likely to be brief to temporary significant adverse. Mitigation measures to minimise the impact of construction noise on the nearest NSLs are set out in Section 8.7.

8.6.1.1 Construction Phase Traffic

Site development and construction phase traffic will be routed through the existing Brooklands residential development onto the Dublin Road. HGVs accessing the development site will be greatest during the delivery of stone with up to 40 trucks moving to and from the site per day. However, as the development is phased, this is only expected to occur over a maximum period of 2 weeks during each phase. Outside of that period the number of HGV movements into and out of the site during each development phase is expected to reduce significantly to 15 – 20 HGVs on busy days and 5 – 10 HGVs on quiet days.

The potential impact of 40 HGV movements per day through the Brooklands Estate has been assessed using the equation outlined above and a truck pass-by sound pressure level of 77@6m from the internal spine road of the Brooklands development to the façade of houses.

The predicted $L_{A,eq,1\ hr}$ values are presented below in Table 8.13:

HGV/hour	Predicted $L_{Aeq,1hour}$ dB
10	59
5	56
1	50

Table 8.13 Predicted noise levels from truck-pass by.

The movement of HGVs through the Brooklands residential development will result in brief elevated noise levels above existing background levels. However, pass-bys are very brief in nature and intense phases such as import of fill be short in duration, therefore, the overall effect on NSLs is not expected to be significant.

8.6.1.2 Construction Phase Vibration

Some construction sources can potentially give rise to appreciable vibration levels. Piling may be required on site for the apartment block foundations. Block D is within 22m of an existing dwelling. It is not anticipated that blasting or rock-breakers will be required due to the soil conditions present. Precautionary mitigation measures for the prevention/management of potential vibration impacts on existing NSLs during site development and construction are outlined in Section 8.7.

8.6.2 Operational Phase

Traffic-Related Noise Impacts

A Traffic Impact Assessment (TIA) has been prepared for the proposed Development by ROADPLAN Consulting. Summary findings are included in Chapter 10.0 – Material Assets. The full TIA is included in Appendix 10.1. Appendix C of the TIA contains the predicted AM and PM peak hour traffic flows at two existing junctions; - the R403/Brooklands/Capdoo Park junction (No. 1) and the R403/Alexandra Walk/ The Avenue roundabout (No. 2). Traffic predictions have been completed for 2022, 2027 and 2037 at the junctions with the development in place and also taking account of increases expected in future base flow traffic using the Transport Infrastructure Ireland (TII) medium growth factors. In addition, traffic flows have been predicted for the R403/Brooklands/Capdoo junction taking account of a potential development by Ardstone Homes to the north and a new relief road proposed as part of that development. Accordingly, the cumulative impact has been considered. As a general rule of thumb, a doubling of traffic flow will likely result in a 3 decibel increase in traffic noise levels. In order to assist with the interpretation of the noise impact associated with vehicular traffic on public roads, Table 8.14 below offers guidance as to the likely noise impact and effect:

Change in Sound Level dB(A)	Subjective Reaction	Magnitude of Impact
0	Inaudible	Neutral
0-2.9	Barely perceptible	Imperceptible
3-4.9	Perceptible	Slight
5-9.9	Up to a doubling of loudness	Moderate
10+	Doubling of loudness and above	Significant

Table 8.14 Likely impact and effect associated with change in traffic noise level (Source: UK Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3 2011).

Percentage total traffic flow increases at both junctions are summarized in Table 8.15 below.

Scenario	% Increase in total flows at Junction 1 above base year flows	% Increase in total flows at Junction 2 above base year flows
2022 AM Peak with Development	12.25	12.57
2027 AM Peak with Development	22.95	23.26
2037 AM Peak with Development	33.60	33.96
2022 PM Peak with Development	12.06	10.98
2027 PM Peak with Development	22.65	21.64
2037 PM Peak with Development	33.33	32.3
2027 AM Peak with Development and Sensitivity Flows	35.64	n/a
2037 AM Peak with Development and Sensitivity Flows	46.64	n/a
2027 PM Peak with Development and Sensitivity Flows	35.95	n/a
2037 PM Peak with Development and Sensitivity Flows	46.99	n/a

Table 8.15 Percentage total traffic flow increases including medium growth of existing base flow.

The above increases at the junctions are mainly due to expected growth in existing traffic flows and are therefore not directly related to the proposed development. The proposed Development alone will result in <7% increase in peak hour flows compared to existing base flow at the junctions. Overall, it is anticipated that there will be no perceptible traffic noise impact on NSLs in the wider Clane area arising from the proposed Development either alone or cumulatively. The effects will be neutral to imperceptible and insignificant. Traffic related noise from the proposed Development will not impact on the potential achievement of the WHO Guidelines for traffic noise in the Clane area.

In addition to reviewing the flow changes at the main junctions, flows were also reviewed in the existing residential estate roads that will be affected. Currently, during the AM and PM peaks, there are 103 and 108 in and outbound vehicles respectively on the Brooklands spine road. Additional development flows during both peak hours will amount to 81 and 85 vehicles or an increase of 78.6% and 78.7% respectively. This equates to an increase of just over 2 decibels during peak hours only which is rated as an imperceptible and insignificant effect. Smaller increases of <35% at expected on Alexandra Walk. Furthermore, in this regard, the Department of Communications, Climate Action and Environment recently published the national Climate Action Plan, 2019. The Plan has an ambitious aim to have almost 1 million electric vehicles (EVs) on Irish Roads by 2030. EVs are typically less noisy than traditional vehicles. It is likely that some of the future estimated flows on the internal spine roads will be EVs.

Inward Noise Impact on Future Residents

Due to the existing site ambient noise levels, it is anticipated that the recommended indoor ambient noise levels and external amenity criteria set out in BS8233:2014 will be achieved within the development with no specific additional measures outside of compliance with current Building Regulations required.

8.7 Avoidance, Remedial and Mitigation Measures

8.7.1 Construction Phase

The use of preformed built elements is a significant mitigating factor to reduce the duration of the construction phase and in turn the duration of the construction-related noise impacts. A CEMP including for noise and vibration will be developed prior to the commencement of site development works. As the construction equipment/process may change subject to the successful tenderer's proposal, the plan will, where necessary to achieve the threshold values/criteria listed in Table 8.8, take account of mitigation measures set out in Section 8 of BS5228: Part 1: 2009 +A1:2014 - Noise Control on Construction and Open Sites. Section 8 identifies measures such as substitution, modification, use of enclosures and siting of equipment in order to minimise impact.

Other general measures to be contained in the plan are as follows:

- The operation of certain pieces of equipment should be managed through monitoring and timing of use in order to ensure that the threshold values/criteria specified are complied with.
- Temporary acoustic screening should be considered along the boundaries with Brooklands where works take place close to the boundary. As a general rule of thumb, it is recommended that temporary screening break the "line of sight" from the sources to the windows of the nearest NSLs where possible.
- During the construction phase all equipment will be required to comply with noise limits set out in EC Directive 2000/14/EC and the 2005/88/EC amendment on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors. The directive covers equipment such as compressors, welding generators, excavators, dozers, loaders and dump trucks.
- A site representative will be appointed for matters related to noise and vibration.
- Any complaints received will be thoroughly investigated.
- A written complaints log will be maintained by the site manager. This will at a minimum record the name of the complainant, date and time of the complaint and a record of the details of the complaint including the date and time of when the effect was observed. This will ensure that the concerns of local residents who may be affected by site activities are considered during the management of activities at the site.
- Monitoring of typical levels of noise will be conducted during critical periods at sensitive locations to ensure that excessive levels above the threshold value for daytime are addressed immediately.
- Suitable mitigation measures taken at the time of excessive noise/complaints such as restricting the use of noisy equipment will be taken.

As a precautionary measure, vibration monitoring is proposed during the construction phase as part of the CEMP at the nearest sensitive receptors when sources likely to cause vibration will be in use. In this regard, test monitoring will be conducted with the equipment on at low levels before increasing incrementally to operational levels. Works will be ceased and mitigation measures implemented during the construction phase where monitoring detects vibration levels associated with the construction phase of the facility above the relevant guidance values.

8.7.2 Operational Phase

There are no adverse impacts or related effects anticipated with the operational phase of the development, therefore no mitigation measures are proposed.

8.8 Predicted Impact of the Proposed Development

8.8.1 Construction Phase

Construction activities are, at times, likely to give rise to temporary elevated noise levels above existing background levels where works are conducted close to existing NSLs. However, this is to be expected with construction activities as reflected in the typical threshold values and criteria applied to construction activities. At a minimum, the threshold values/criteria will be adhered to and a comprehensive CEMP

including for noise and vibration will be implemented to minimise construction noise impact and effect on existing NSLs. Over the full duration of the works, the effect is not expected to be significant.

8.8.2 Operational Phase

There are no predicted significant impacts arising during the operational phase is as set out under Section 8.6.2. An inward assessment of noise risk to future residents indicates that the existing ambient sound environment poses a negligible noise risk. In the long term, existing NSLs are not likely to experience any significant change to current ambient sound levels arising as a result of the proposed development. The effect is expected to be neutral.

8.9 Monitoring and Reinstatement

8.9.1 Construction Phase

The contractor will be required to ensure construction activities operate within the noise and vibration limits set out within this assessment. The contractor will be required to undertake regular noise monitoring at locations representative of the closest NSLs to ensure the relevant criteria are not exceeded. Vibration test monitoring will be required as a precautionary measure during piling to ensure that limits are not exceeded at the nearest sensitive receptors.

8.9.2 Operational Phase

No monitoring is proposed during the operational phase.

8.10 Cumulative Impacts

An application by Ardstone Homes for planning permission for residential development is currently in process with regard to lands approx. 460m to the west of the proposed Development Site. The construction phases are likely to overlap however due to distance, intervening sources and screening, no cumulative impact is expected on any NSL in terms of noise or vibration impact.

Long term cumulative impacts have been assessed under Section 8.6.2 above dealing with traffic noise impacts.

9.0 AIR QUALITY AND CLIMATE

9.1 Introduction

This chapter identifies and assesses the potential air quality and climate impacts and associated potential effects, arising from both the construction and operational phases of the proposed Development on Lands at Capdoo & Abbeylands, Clane.

9.1.1 Competent Expertise

This chapter has been prepared by Ms. Siobhan Maher, Redkite Environmental Ltd.

Ms. Maher's relevant qualifications and experience include:

- BSc. Analytical Science (Chemistry) from Dublin City University;
- Master of Technology (M.Tech.) Environmental Management from University of Limerick;
- Senior Consultant, Malone O' Regan Environmental Services, 1998 -2001;
- Technical Director, Malone O' Regan Environmental Services, 2001 – 2013;
- Business Development, OES Consulting, 2013 – 2014;
- Managing Director, Redkite Environmental 2014 – present.

Ms. Maher has over 20 years' experience project managing and preparing assessments for EIARs covering a large variety of project types including major infrastructural projects such as road schemes and ports, industrial projects in the dairy, food processing and pharmaceutical sectors, extractive industries including peat harvesting and leisure, residential and commercial projects.

9.2 Methodology

9.2.1 Background Information

Prior to setting out the methodology used in this assessment, the following section sets out key background information relevant to understanding the approach to air quality and climate assessments.

EU Legislation

In order to protect health, vegetation and ecosystems, limit and target values for various air pollutants are set in the latest EU legislation, the Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive 2008/50/EC and the Fourth Daughter Directive 2004/107/EC relating to selected metals and polyaromatic hydrocarbons (PAHs) in ambient air quality. The CAFÉ Directive replace the earlier framework Directive (96/62/EC) and three daughter directives arising from it. The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). The 4th Daughter Directive was transposed by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. No. 58 of 2009).

A summary of applicable limit values are set out in Table 9.1 overleaf. These values form the basis or criteria against which potential impacts on air quality as a result of the proposed Development are assessed.

The EPA and local authorities operate and maintain a network of monitoring stations throughout Ireland as part of the monitoring requirements under the CAFÉ Directive and to evaluate and report on ambient air quality relative to the limits set out above. A report on ambient air quality is produced annually by the EPA. These reports have been used in this assessment to determine the likely existing ambient air quality at the Proposed Development Site.More stringent World Health Organisation (WHO) Air Quality Guidelines for some pollutants exist however these do not have a legal basis in Ireland at present. Nevertheless, the EPA does make reference to the WHO Guidelines with regard to air quality monitoring results as part of its annual reporting on air quality in Ireland.[1]

[1] Air Quality in Ireland, 2017 - Indicators of Air Quality, EPA 2018.

Pollutant	EU Regulation	Limit Type	Margin of Tolerance	Value
Nitrogen Dioxide (NO_2)	2008/50/EC	Hourly limit for the protection of health not to be exceeded more than 18 times per year	None	200 µg/m^3
		Annual limit for the protection of human health	None	40 µg/m^3
		Annual limit for the protection of vegetation	None	30 µg/m^3 No+NO_2
Sulphur Dioxide (SO_2)	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 per year	None	125 µg/m^3
		Annual and winter limit for the protection of human health and 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 per year.	50%	50 µg/m^3
		Annual limit for protection of human health	20%	40 µg/m^3
Particulate Matter as $PM_{2.5}$	2008/50/EC	Annual limit for the protection of human health (Stage 1)	20% from June 2008. Decreasing linearly to 0% by 2015	25 µg/m^3
		Annual limit for protection of human heath (Stage 2)	To be achieved by 2020	20 µg/m^3
Carbon Monoxide (CO)	2008/50/EC	8-hour limit on a rolling basis for the protection of health.	60%	10 mg/m^3
Benzene (C_6H_6)	2008/50/EC	Annual limit for protection of human health	0% by 2010	5 µg/m^3

Table 9.1 Air quality standards, Regulations 2011.

Dust Emissions

Emissions of dust can occur during site development and construction phases and can vary substantially from day to day depending on weather conditions, level of activity and specific operations undertaken. Emissions can cause nuisance due to soiling of surfaces i.e. dust deposition by large particles. Additionally, long term dust particles less than 10 µm and less than 2.5 µm may potentially give rise to health effects and are covered by the limits for PM_{10} and $PM_{2.5}$ set out in Table 9.1 above. Dust emissions may also affect sensitive ecological receptors through, for example, smothering of vegetation. There are no specific criteria specified for nuisance (inert) dust in Ireland. Generally, the German TA-Luft standard for dust deposition causing possible nuisance of 350 mg/m^2/day is often applied for certain activities including site development and construction works, quarrying and often in Industrial Emission (IE) licences issued by the EPA.

Climate Change

In July 2019, the government published the Climate Action Plan, 2019. This Plan sets out how Ireland intends to deal with the climate challenge (directly in Ireland (drought and flooding) and worldwide (desertification, rising sea levels, changes in habitats and displaced population) caused by the emission

of Greenhouse Gases (GHGs). The most important of these gases are carbon dioxide, methane and nitrous oxide. Collectively, GHGs and their reduction are the subject of international agreements such as the United Nations Framework Convention on Climate Change and Paris Agreement. Commitments given by the EU and Ireland under the International Agreements underlie the Climate Action Plan.

The objective of the Plan is to enable Ireland to meet its EU targets to reduce its carbon emissions from the non-ETS2 sector by 30 per cent between 2021 and 2030 and lay the foundations for achieving net zero carbon emissions by 2050. This is an ambitious target to meet. The Plan sets out 180 actions that need to be taken and extends to all sectors of the economy. Key measures are set for a number of sectors including transport, agriculture electricity, built environment and the waste and the circular economy. Targets for 2030 include:

- 70% of electricity generated by renewable sources;
- 500,000 existing homes to upgrade to B2 equivalent BER;
- 600,000 heat pumps installed;
- Increase the number of electric vehicles to 1 million;
- Reduce food waste by 50%;
- Plant 8,000 ha of newly planted forest per year.

The approach to reducing carbon emissions will include (non-exhaustive list):

- Five year carbon budgets and sectoral targets with a detailed plan of actions to deliver them;
- The setting up of a Climate Action Delivery Board overseen by the Department of the Taoiseach, and,
- An independent Climate Action Council to recommend the Carbon Budget and evaluate policy.

Ireland's agriculture sector accounts for 33% of total national emissions and 46% of emissions in the non-ETS sector. In the ETS sector, fossil fuel combustion by the power generation sector continue to be key contributors. It is important to understand the national situation and policy when determining the level of assessment required with regard to potential impacts relevant to climate change, arising from a proposal such as the proposed Development at Capdoo Commons.

GHG Emission Trends 2015 – 2017

The following is extracted from the Plan with regard to current emission trends:

> *Total national emissions fell from a high of 69.5 Mt CO2eq. in 2005 to 59.7 Mt CO2eq. in 2011 (-14.1%). In terms of the non-ETS sectors, emissions fell from 47.1 Mt CO2eq. in 2005 to 41.2 Mt CO2eq. in 2011 (-12.5%). However, the economic recovery and associated growth in key sectors, such as agriculture and transport, has seen non-ETS emissions rise to 43.8 Mt CO2eq. in 2017 (+6.3%). This provides a challenging context for national ambitions to deliver on increasingly stringent annual targets out to 2030.*

Long-range Transboundary Air Pollution

In addition to the commitments with regard to GHGs, Ireland is also required to reduce and report on long range transboundary air pollutants (Sulphur Dioxide, Nitrogen Oxides, Non-Methane Volatile Organic Compounds (NMVOCs), Ammonia and $PM_{2.5}$) under the Gothenburg Protocol. Transboundary pollutants can be precursors to acid deposition which is associated with the acidification of soils and water and can be involved in the formation of secondary particulate matter and can also cause health effects.

Initial targets were set for 2010 (excluding $PM_{2.5}$) and were revised in 2012 to include national emission reduction commitments for the main air pollutants to be achieved by 2020. According to the EPA[3]:

[2] Non-ETS is the non- Emissions trading Sector and includes emissions from agriculture, transport and the built environment. ETS includes large industry and electricity generators which are dealt with differently by the EU through the use of a cap and trade system where EU wide limits exist.
[3] EPA Infographic on Ai Pollutant Emissions in Ireland, 05/2019

- Sulphur Dioxide emissions have reduced by 93% since 1990 largely due to the removal of sulphur in fuels;
- Nitrogen oxides emissions have decreased by 38% since 1990. Agriculture is a significant source but transport accounts for 41% of emissions;
- Ammonia emissions have increased by 8% since 1990. Animal manures produce 90% of emissions;
- NMVOCs have decreased by 22% since 1990. Agriculture is the second largest source accounting for 41% of emissions. Production of food and beverages accounts for 23%.
- $PM_{2.5}$ – the main source is the combustion of fuels in the residential and commercial sectors. Fuel switching from coal and peat to kerosene and natural gas has reduced emissions significantly.

Ireland remains compliant with its requirements under the Gothenburg Protocol with the exception of ammonia and this is solely due to expansion of the agricultural sector.

In the future, the EPA notes that *" current projections suggest that compliance with both the NOx and NMVOC emission reduction targets for 2030 will be a challenge. Energy efficiency measures across society, more fuel efficient vehicles, refit support scheme and smoky coal ban will have sizeable impacts on reducing emissions into the future."*

As noted earlier, it is important to take stock of or analyse the national situation vis a vis the proposed Development when determining the level of assessment required with regard to transboundary pollutants.

9.2.2 Construction Phase

The Institute of Air Quality Management (IAQM) has produced Guidance on the Assessment of Dust from Demolition and Construction, Version 1.1 2014[4]. This has been used to qualitatively identify the risk of dust impact arising from the site development and construction phase of development. The Guidance describes a 5-stage approach to the assessment as follows:

- Screen the proposed Development to determine if there is a requirement for a more detailed assessment;
- Determine the risk of dust impact arising based on the magnitude of dust emissions from different stages of site development and construction and the sensitivity of receptors in the area;
- Determine site specific appropriate mitigation;
- Determine the residual effects and whether these are significant, and,
- Prepare the dust assessment report.

The magnitude of dust emissions is determined based on the following scale of works anticipated:

Activity	Dust Emission Magnitude	
Demolition	Large	Total Building Volume >50,000m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20m above ground level.
	Medium	Total Building Volume 20,000 - 50,000m^3, potentially dusty construction material demolition activities 10-20m above ground level demolition during wetter months.
	Small	Total Building Volume <20,000m^3, construction material with low potential for dust release e.g. metal cladding, timbers, demolition activities <10m above ground level, demolition during wetter months.
Earthworks	Large	Total site area >10,000m^2, potentially dusty soil type (e.g. clay which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100,000 tonnes.

[4] Updated in 2016 to revise Table 3 on Health Effects.

	Medium	Total site area 2,500 - 10,000m^2, moderately dusty soil type (e.g. silt), 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 4 - 8m in height, total material moved 20,000 tonnes – 100,000 tonnes.
	Small	Total site area <2,500m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, total material moved <20,000 tonnes, earthworks during wetter months.
Construction	Large	Total Building Volume >100,000m^3 , on site concrete batching, sand blasting.
	Medium	Total Building Volume 25,000 - 100,000m^3 , potential dusty construction material (e.g. concrete), on site concrete batching;
	Small	Total Building Volume <25,000m^3 , construction material with low potential for dust release (e.g. metal cladding and timber)
Track-out	Large	>50 Heavy duty vehicles (HDV) (>3.5t) outward movement in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m
	Medium	10 - 50 Heavy duty vehicles (HDV) (>3.5t) outward movement in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 -100m.
	Small	<10 Heavy duty vehicles (HDV) (>3.5t) outward movement in any one day, surface material with low potential for dust release, unpaved road length <50m

Table 9.2 Quantitative determination of the magnitude of dust emissions from demolition and construction activities.

Once the magnitude of the works are defined then the sensitivity of the area is also identified and combined with the magnitude to form the dust risk. The sensitivity takes account of a number of factors as follows:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM_{10}, the background concentration, and,
- Site specific factors such as whether there are natural shelters such as trees to reduce the risk of wind - blown dust.

The key receptors to be considered are:

- Receptors sensitive to dust soiling/ deposition;
- Human beings and health effects of PM_{10}; and,
- Sensitive ecological receptors.

Sensitivity of each receptor type is determined as high, medium or low and is site specific. There is no unified sensitivity classification scheme although the IAQM document provides information on identifying the level of sensitivity for the above receptors. For example high sensitivity receptors for dust soiling effects include:

- Users can reasonably expect enjoyment of a high level of amenity, or,
- The appearance, aesthetics or value of their property would be diminished.

Indictive examples include dwellings, museums, medium and long term car-parks and car showrooms. A high sensitivity receptor for ecological effects includes locations with an international or national designation *and* the designated features may be affected by dust soiling. The approach calls for the number of receptors (classed as high, medium or low types) within designated distances <20, 50,100, 350m (for dust soiling and health impacts) to the source to also be identified. With regard to ecological receptors, the distances specified are <20 and <50m. This must be identified for each stage (i.e. demolition, earthworks, construction and track-out).

Table 2 of the Guidance is reproduced below, detailing the assignment of sensitivity ratings for dust soiling taking account of receptor sensitivity, number and distance to source. Tables 3 and 4 of the Guidance reproduce similar tables for rating sensitivity of the area to human health impacts and ecological impacts.

Receptor Sensitivity	Number of Receptors	Distance from Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 9.3 Sensitivity of the area to dust soiling effects on people and property.

Once the sensitivity of the Area is defined, then the risk of dust impact is determined for each stage by combining the sensitivity and the dust emission magnitude with no mitigation applied. The Guidance provides matrices for this aspect of assessment also. The matrix for earthworks is provided below:

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible

Table 9.4 Risk of dust impacts – earthworks.

Once the risk of dust impact is determined for each phase then site specific mitigation measures are developed commensurate with the level of risk and the residual impact thereafter assigned.

9.2.3 Operational Phase

The assessment of impact on air quality arising during the operational phase is mainly concerned with traffic-related emissions and to a much lesser extent, emissions from heating and indirectly from electricity use. The UK Highways Agency Design Manual for Roads and Bridges (DMRB), Volume 11, Section3, Part 1 (HA207/07) recommends a phased approach to the assessment of impact on air quality and that the complexity be consistent with the risk of failing to achieve the air quality standards. Initial scoping based on a desk-based review of background air quality, the magnitude of the proposed Development and the traffic data, indicates that a detailed assessment is not required. The UK DMRB states that road links meeting one or more of the following criteria can be defined as being 'affected' by a proposed Development and should be included in a local air quality assessment:

- Road alignment changes of 50m or more;
- Daily traffic flows changes by 1,000 AADT or more;
- HGV flow change by 200 vehicles per day or more;
- Daily average speed changes by 10km/h or more, or,
- Peak hour speed changes by 20 km/h or more.

This is not considered to apply to the proposed Development.

9.2.4 EPA Guidelines

The EPA draft document entitled Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, 2017 also contains general guidance on the assessing of environmental effects in terms of quality, significance, duration, magnitude and type. This document has also been considered in defining air quality impacts and related effects in this chapter.

9.3 Receiving Environment

The proposed Development Site is located on the outskirts of Clane town in an area that can be described as suburban/rural. The site is removed from main sources of transport including the M3 approximately 10km to the north/northeast and the M7, approximately 4km to the south/southeast. The main sources of gaseous and fine particulate emissions in the vicinity of the proposed Development Site are local roads and residential, commercial and industrial heating; although the town is mainly residential in nature. Emissions of dust are also likely to arise intermittently from agricultural activities in the surrounding area. Overall, the contribution of traffic to air quality is likely to be the most significant source of influence to air quality in the vicinity of the Development Site.

9.3.1 Ambient Air Quality

The existing ambient air quality has been determined through desk-review of reports prepared by the EPA annually on air quality in Ireland. Reports for Years 2015 – 2017 have been reviewed. For ambient air quality and monitoring in Ireland, four zones A,B,C and D are defined in the Air Quality Standards Regulations, 2011. The zones represent the following areas:

- Zone A - Dublin Conurbation;
- Zone B – Cork Conurbation;
- Zone C – 24 cities and large towns (e.g. Galway, Limerick Naas, Newbridge), and,
- Zone D – Rural Ireland i.e. the State excluding Zones A,B and C.

The proposed Development Site falls within Zone D. Air quality monitoring data from Zone D sites are therefore considered to be representative of the air quality at the proposed Development Site. These sites include Emo Court, Enniscorthy, Castlebar, Kilkitt, Shannon Estuary, Claremorris and Longford town. A summary of the data from the representative sites is presented in Table 9.5 below:

Parameter	Averaging Interval	Unit	Value
Nitrogen Dioxide NO_2	Annual Mean	µg/m^3	5.4
Nitrogen Oxides NOx	Annual Mean	µg/m^3	7.31
Particulate Matter PM_{10}	Annual Mean	µg/m^3	11.43
Particulate Matter $PM_{2.5}$	Annual Mean	µg/m^3	8.13
Carbon Monoxide	Annual Mean 8-hour	mg/m^3	0.55
Sulphur Dioxide SO_2	Annual Mean	µg/m^3	2.02
Benzene	Annual Mean	µg/m^3	*

Table 9.5 Summary background air quality data for stations in Zone D *Not measured at Zone D sites during the period 2015 – 2017 based on review of EPA Air Quality Monitoring Reports 2015 – 2017. Measurements in Zone C are well under the annual mean.

It is noted from the data that the existing ambient air quality is good for all health related pollutants. All concentrations are well-within the EU limits for all parameters of interest.

9.3.2 Meteorological Data

The magnitude of potential impacts on air quality as a result of development will be influenced by local meteorological conditions which are a key consideration particularly with regard to the construction phase of the proposed Development. Wind speed and direction in particular are important in determining how emissions associated with an activity will be dispersed. An evaluation of the local climatic conditions is therefore useful for an assessment of the type required for this study.

Met Eireann operate synoptic stations throughout the country. The nearest station to the proposed Development Site with comprehensive monitoring data is located at Casement Aerodrome. The windroses for Casement Aerodrome were reviewed for the years 2016 – 2018.The dominant wind direction for Casement Aerodrome is from the southwest. The annual average data for the 30[5] year period 1981 -2010 is presented as follows:

[5] Climate averages are computed over 30 year periods to smooth out year to year variations.

- Temperature 9.7 ^{o}C
- Rainfall, 754mm
- Average wind speed 5.5 m/s

The average wind speed is quite low (gentle breeze) and is typical of this part of the country.

9.4 Characteristics of the Proposed Development

The proposed Development comprises 305 residential units, a creche and associated infrastructure including internal roads, footpaths and foul, surface water and water supply networks. A linear park will be developed along the line of the River Liffey. The residential units will be mixed comprising apartments, maisonettes, terraced and semi-detached units. There are no commercial or retail units associated with the proposed Development. The site will be built out in 4 phases over a 5 year period in total. Accordingly, site works and construction will proceed on a piecemeal basis rather than, for example, the complete stripping of topsoil and subsoil during one event.

During construction, pre-mixed concrete will be brought to site. There will be no batch concreting. The proposed buildings are timber frame. According, a significant proportion of pre-made elements will be brought to site which reduces the potential for dust emissions. Approximately 11,211 m^3 of stone fill material will be required to be brought to site for roads and foundations split out over the 4 phases. In addition, soils and sub-soils will be excavated and re-used on the site. The total quantity moved for the overall development is estimated at 24,584m^3. Approx. 11,257m^3 will comprise topsoil that will be stored and re-used for landscaping. In the long term, gas will be the principal source of heating used. In addition, the applicant proposes to target A2/A3 BER for the units. To achieve the above high energy efficiency and low carbon emission performances the following will be included:

- Highly insulated building fabric.
- High performance low u value windows and doors.
- Energy efficient light fittings and white goods.
- Mechanical heat recovery ventilation.
- On roof PV Solar panels.
- Air to water heat pumps and / or condensing A rated boilers.
- Electric car charging points.

A Mobility Management Plan will be implemented to encourage alternative modes of transport to reduce reliance on cars.

9.5 Potential Impact of the Proposed Development

9.5.1 Construction Phase

The potential impacts on air quality and related effects during the site development and construction phases are mainly related to:

- Dust deposition on high sensitivity receptors such as adjacent residential areas in Brooklands;
- Effects on human health arising from PM_{10} and $PM_{2.5}$ particles in suspended matter (dust);
- Dust deposition and smothering of vegetation.

A number of HGVs will be used during the site development and construction phase. However, it is not considered that there is a potential for significant impact on ambient air quality arising from exhaust emissions from a limited number of vehicles. The risk of dust arising as a result of track-out on local roads is identified in Section 9.6.1 below.

9.5.2 Operational Phase

During the operational phase, the potential for impact on air quality and indirect effects on climate change arising from GHG emissions from the development in general can arise from the combustion of fuel by vehicles and from heating resulting in the emissions of particulate matter and gases such as NOx , CO_2 and CO.

9.6 Impact Assessment

9.6.1 Construction Phase

The potential dust risks associated with the site development and construction phases have been assessed in accordance with the IAQM Guidelines. The proposed Development Site has a 'human receptor' within 350m of the boundary and within 50m of the route for construction therefore the proposal is deemed to require a more detailed assessment based on the screening criteria in the IAQM Guidance. The magnitude of the dust emission is presented in summary as follows:

Activity	Dust Emission Magnitude
Earthworks	Medium
Construction	Medium to Small
Trackout	Small

Table 9.6 Estimated magnitude of dust emissions.

The above table is based on the following assumptions:

- The overall site will be developed in 4 main phases. Phasing is an inherent mitigation measure for controlling dust emissions. Phased areas for development were reduced to <20,000m^2.
- Soil type is mixed between sand, clay and gravel with silt closer to the river. Clay particles are the smallest (<0.002mm) followed by silt (0.002 – 0.06mm) and sand (0.06 – 2mm).
- Total existing material to be moved for the entire site is estimated at 36,876 tonnes. This is split between phases.
- HGVs on average will be <20 (5 – 10) per day.
- No concrete batching or sand blasting will be carried out.
- Pre-formed building elements will be brought to site. Buildings will be timber framed.
- Total building volume for the largest phase is estimated at 25,000 -100,000 m^3.
- Haul roads within the site will be filled with stone and construction traffic will be routed on paved surfaces.

The outcome of defining the sensitivity of the area is as follows:

Potential Impact	Sensitivity of the Surrounding Area		
	Earthworks	**Construction**	**Trackout**
Dust Deposition	Medium	Medium	Medium
Human Health	Low	Low	Low
Ecology	Medium	Medium	Low

Table 9.7 Sensitivity ratings summary

The above table is based on the following:

- Residential receptors within <20m (1 – 10), <50m (10 -100), <100m (>100).
- Receptor numbers for track-out are based on 200m distant from the site for effects to occur and within <20 and <50m radius of roadside.
- Background PM_{10} concentrations are low and well within the relevant AQS.
- The river Liffey is sufficient distance from the main works to be outside the scope of dust assessment.
- Although there are no listed sites nearby, hedgerows on site are of high local importance.

A summary table combining the sensitivities of receptors with the dust magnitude for each stage is presented below giving the overall dust risk:

Source	Dust Deposition	Human Health	Ecology
Earthworks	Medium risk	Low risk	Medium risk
Construction	Medium risk	Low risk	Medium risk
Trackout	Negligible	Negligible	Negligible

Table 9.7 Sensitivity of receptors.

The assessment indicates that most significant potential impacts and effects are those associated with excavation and construction works. A number of mitigation measures will be implemented as detailed below in Section 9.7.1, commensurate with the level of risk identified above.

9.6.2 Operational Phase

As noted under Section 9.2.3 above, the potential impact of traffic related emissions arising as a direct result of the proposed Development on AQSs is likely to be insignificant, taking account of the likely changes in AADT and the existing background concentrations of pollutants.

Natural gas will be used as a heating fuel in the long term. Natural gas contains little to no sulphur or potential for particulate emissions. Nitrogen oxide emissions from boilers run on natural gas are significantly lower than those associated with other fossil fuels.

GHGs and long range transboundary pollutant emissions will be insignificant particularly when considered in the national context where actions in other sectors have been identified as required to reduce emissions.

The proposed Development will have a high energy efficiency rating and this factor is the most important in contributing, however small, to achieving Ireland's goals under climate and transboundary pollutant agreements as outlined in Section 9.2.

9.7 Avoidance, Remedial and Mitigation Measures

9.7.1 Construction Phase

A CEMP including for dust management will be developed prior to the commencement of site development works. The principal objective of the Plan will be to ensure that dust emissions do not cause significant dust soiling on nearby residential receptors. Key features are summarised as follows:

- A designated Site Agent will be assigned overall responsibility for Dust Management;
- The design of the site development and construction programme will consider dust impact management and choose design approaches to minimise dust emissions;
- An effective training programme for site personnel will be implemented for the duration of the site development works and construction stages;
- A strategy for ensuring effective communication with the local community will be developed and implemented;
- A programme of dust minimisation and control measures will be implemented and regularly reviewed;
- A monitoring programme will be implemented.

The design of the site development and construction programme and the location and layout of the construction compound and the storage of materials will be carefully planned to ensure that air quality impacts are minimised.

The following is a summary of the main mitigation features of the project and the specific mitigation measures which will be employed in order to minimise emissions from the activity and the associated impacts of such emissions:

- Activities with potential for significant emissions will wherever possible be located at a position as far as possible removed from the nearest residential receptors;

- The areas on site which vehicles will be travelling on will generally be hard-surfaced or compressed ground thus significantly reducing the potential for dust emissions from the vehicles;
- Stock piles of soil and sub-soil and activities potentially giving rise to soil erosion will be strictly controlled (Refer to Chapter 6.0);
- The construction compound area will have hard standing areas to minimise dust generation from wind-blow;
- In order to minimise the potential for wind-generated emissions from material storage bays, these bays will be oriented away from the dominant wind direction to minimise the effects of wind on release of dust and particulate;
- Existing vegetation along the boundaries will be retained as screening;
- The relatively mixed particle size associated with the activity means that the particles will generally be deposited close to the emission source and will not travel significant distances away from the site;
- Fixed and mobile water sprays will be used to control dust emissions from material stockpiles and road and yard surfaces as necessary in dry and/or windy weather;
- A wheel-wash will be used where necessary to reduce mud deposition on local roads;
- A daily inspection programme will be formulated and implemented in order to ensure that dust control measures are inspected to verify effective operation and management, and,
- A dust deposition monitoring programme will be implemented at the site boundaries for the duration of the construction phase in order to verify the continued compliance with relevant standards and limits.

9.7.2 Operational Phase

No specific additional mitigation measures are proposed with regard to the long term operational phase of development. The proposed Development has inherent mitigating factors within the design to minimise impact in terms of GHGs and other pollutants.

9.8 Predicted Impact of the Proposal

9.8.1 Construction Phase

The predicted impact on ambient air quality and effects on human beings in terms of nuisance dust deposition, health and on ecological receptors are expected to be temporary to short term insignificant provided the dust generation avoidance, prevention and minimisation measures outlined in Sections 9.4.1 and 9.7.1 are implemented.

9.8.2 Operational Phase

In the long term, the proposed Development is anticipated to have an imperceptible impact on ambient air quality. Energy efficiency proposals inherent in the design will contribute, however small, to the goals outlined in the Climate Action Plan, 2019.

9.9 Monitoring and Reinstatement

Monitoring of dust deposition using standard Bergerhoff dust gauges during the site development and construction phases at the boundaries with sensitive receptors will be completed to ensure that dust minimisation measures are operating effectively. The monitoring results will be regularly reviewed to inform any changes required to activities on site.

9.10 Cumulative Impacts

The potential for cumulative impact on air quality arising from traffic has been considered. The proposed Development alone will not result in significant additions to existing traffic levels on the surrounding road network. Growth in existing baseflow is expected to occur at a more significant level than the traffic from the proposed Development. However, cumulatively, the traffic flows likely to occur in the future (based on a review of the traffic counts undertaken and existing and future peak hour flow projections) will not significantly impact on existing ambient air quality. It is expected that the existing ambient air quality status will be maintained and will be unaffected.

10.0 MATERIAL ASSETS

10.1 Introduction

Material Assets as defined in the 'Advice Guidelines on the Information to be contained in Environmental Impact Assessment Reports DRAFT' (EPA, 2017) as 'built services and infrastructure'. This includes roads and traffic, electricity, telecommunications, gas, water supply infrastructure and sewerage (built infrastructure). The EPA Advice Notes for Preparing Environmental Impact Statements, Draft 2015 refer to material assets as "resources that are valued and intrinsic to specific places." Accordingly, material assets can be a broad and less easily definable subject for assessment.

Generally, the objective of the assessment of impact on such assets is to ensure that they are used in a sustainable manner, so ensure continued availability for future generations after the development of a project.

Chapter 7.0 dealing with Water also contains the assessment of impact on water supply, foul water infrastructure and the potential for impact on properties downstream as a result of flooding. Accordingly, this chapter deals with the impact on the following material assets:

- Traffic and transportation infrastructure, and,
- Other networks including telecommunications and gas supply.

10.1.1 Competent Expertise

This chapter has been collated by Ms. Siobhan Maher, Redkite Environmental Ltd. However, the Traffic Impact Assessment (TIA) has been prepared by traffic specialist Mr. Dermot Donovan of ROADPLAN Consulting.

Mr. Dermot Donovan is a Director of Roadplan Consulting with over 30 years experience in road safety audit, transportation safety assessment, transportation assessment and design. Dermot has the following qualifications Civil Engineer B.E. (Civil), UCD, 1982, Dip. Environmental Engineering, TCD, 1993, Chartered Engineer Institution of Engineers of Ireland FIEI 2006, Road Safety Auditor, 2006: Team Leader status (NRA Ref. No. DD50250), Professional Certificate on Road Safety Audits, UCD, 2011.

10.1.2 Methodology

Traffic and Transportation

The methodology used by ROADPLAN Consulting for preparing the TIA is presented below:

- A traffic count was undertaken by Irish Traffic Surveys during a 12-hour period (07:00 to 19:00). Count information was obtained at the existing R403 / Brooklands / Capdoo Park crossroads and the existing R403 / Alexandra Walk / The Avenue roundabout.
- Existing Traffic Assessment – A spreadsheet model was created which contains the base year DO-NOTHING traffic count data described above. The traffic count data was used to develop a PICADY model of the existing R403 / Brooklands / Capdoo Park crossroads and an ARCADY model of the existing R403 / Alexandra Walk / The Avenue roundabout.
  Traffic signal poles are installed at the R403 / Brooklands / Capdoo Park crossroads junction. However, the signals are currently not operational. The traffic count data was also used to develop a TRANSYT model of the R403 / Brooklands / Capdoo Park junction to assess the operational performance of the signals.
- Future Year Assessment – The estimated future year traffic volumes on the study area road network, as a result of the increase in background traffic and the additional development related traffic was used to assess the future operational performance of the junctions both at the year of opening of the development, 5 and 15 years after opening.
- Parking Requirements – Car parking provision for the proposed Development was assessed against the parking standards as set out in the Kildare County Development Plan.

In preparing the TIA, ROADPLAN Consulting has made reference to:

- The Kildare County Development Plan 2017 - 2023.
- The Institute of Highways and Transportation Guidelines on the Preparation of Traffic
- Impact Assessments.
- The TII Transport Assessment Guidelines.
- The TII National Traffic Model.

The full report prepared by ROADPLAN Consulting is included in Appendix 10.1.

Other Infrastructure/Utilities

The following maps were reviewed:

- Gas Networks Ireland Service Plans;
- ESB Networks Utility Plans, and,
- Eir E-Maps.

10.2 Traffic and Transportation

The main objective of this section of the EIAR is to examine the traffic implications of the proposed Development in terms of how it can integrate with existing traffic in the area. The assessment will determine and quantify the extent of additional trips generated by the development, and the impact of such trips on the operational performance of the local road network and junctions.

10.2.1 Receiving Environment

The proposed residential development is located at Capdoo Commons/Abbeyands on the northeastern outskirts of Clane town, approx. 750m from the town centre. The proposed Development Site is currently un-developed and in agricultural use. It is currently accessed through the adjoining Brooklands development along the western boundary.

The main routes in the vicinity of the proposed Development Site are the R403 from Clane to Celbridge linked to the R407 to Sallins by the Clane Inner Relief Road.

Access to the proposed Development will be via the existing R403/Brooklands/Capdoo Park cross-roads and the R403/Alexandra Walk/The Avenue roundabout.

Refer to Figure 10.1 overleaf for junction locations and general existing road layout in the Clane area.

Existing Traffic Flows

A traffic count was undertaken during a 12-hour period (07:00 to 19:00). The count data is provided in Appendix 10.1, Appendix B – Traffic Counts. Count information was obtained at the following junctions:

- R403 / Brooklands / Capdoo Park crossroads
- R403 / Alexandra Walk / The Avenue roundabout

The traffic flows during the AM and PM peak hours were abstracted from the surveyed data and are shown in Tables 10.1 – 10.4. overleaf. A summary of the count data for the peak hour flows is provided in Appendix 10.1, Appendix C.

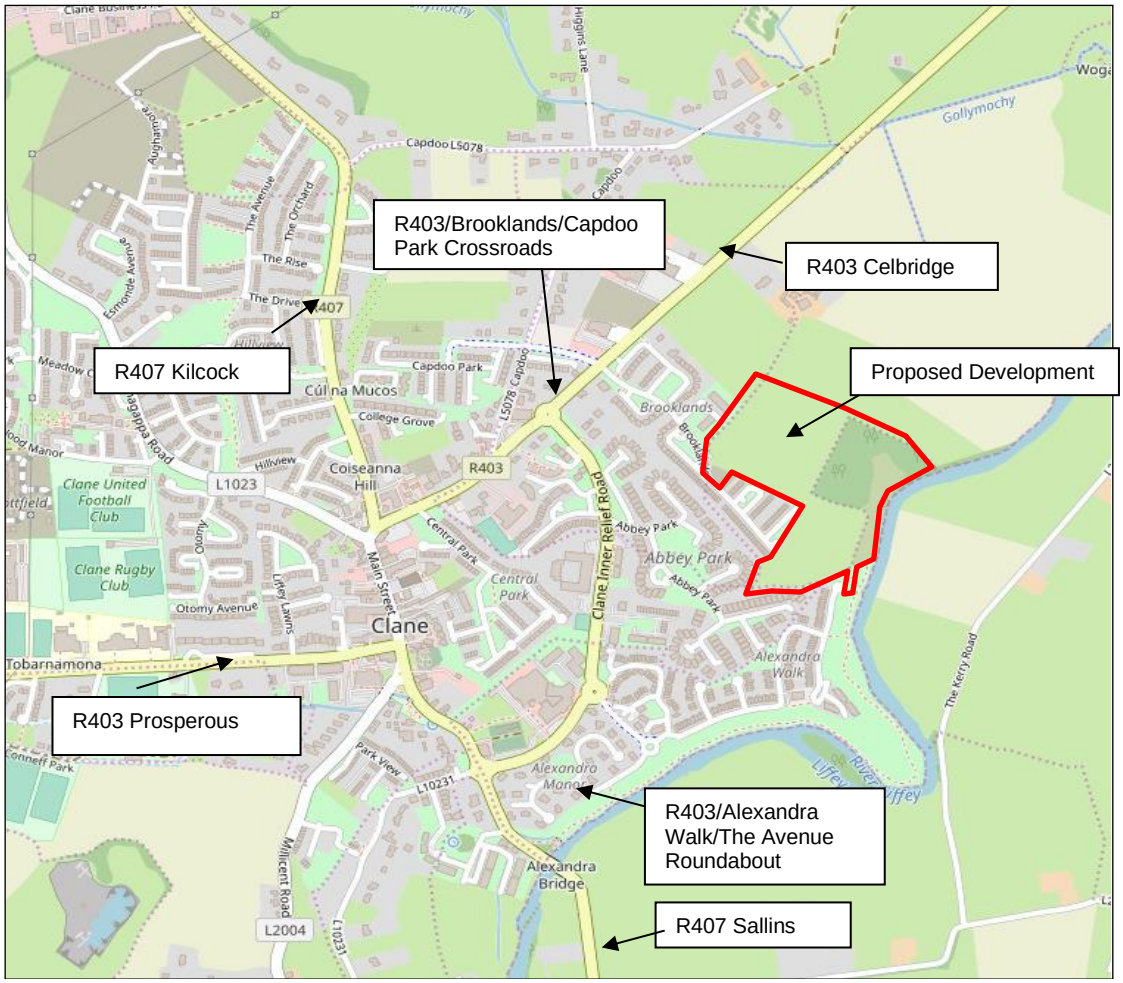

Figure 10.1 Existing road network.

R403/Brooklands/Capdoo Park Crossroads

From/To	R403 Celbridge	Brooklands	R403 Clane	Capdoo Park	Totals
R403 Celbridge	0	1	285	10	**296**
Brooklands	31	0	58	1	**90**
R403 Clane	799	9	0	14	**822**
Capdoo Park	39	3	15	0	**57**
Totals	**869**	**13**	**358**	**25**	**1265**

Table 10.1 AM peak existing (07.30 – 08.30).

From/To	R403 Celbridge	Brooklands	R403 Clane	Capdoo Park	Totals
R403 Celbridge	0	24	797	42	**863**
Brooklands	6	0	32	3	**41**
R403 Clane	365	43	0	36	**444**
Capdoo Park	18	0	11	0	**29**
Totals	**389**	**67**	**840**	**81**	**1377**

Table 10.2 PM peak existing (17.30 – 18.30).

R403/Alexandra Walk/The Avenue Roundabout

From/To	R403 (east)	Alexandra Walk	R403 (west)	The Avenue	Totals
R403 (east)	0	29	313	1	**343**
Alexandra Walk	72	0	85	0	**157**
R403 (west)	362	21	0	4	**387**
The Avenue	10	0	6	0	**16**
Totals	**444**	**50**	**404**	**5**	**903**

Table 10.3 AM Peak Existing (07.30 – 08.30).

From/To	R403 (east)	Alexandra Walk	R403 (west)	The Avenue	Totals
R403 (east)	0	49	580	9	**638**
Alexandra Walk	31	0	31	0	**62**
R403 (west)	440	70	3	10	**523**
The Avenue	3	0	3	0	**6**
Totals	**474**	**119**	**617**	**19**	**1229**

Table 10.4 PM peak existing (17.30 – 18.30).

Existing Road Network

Brooklands road is a cul-de-sac and provides access from the R403 to a number of residential developments. It is proposed to access the development via Brooklands road. The cross-section of Brooklands road is as follows:

- 6m wide carriageway;
- 2m wide footpaths with a 1m wide grass verge are located on either side of the carriageway;
- Street lighting is provided along Brooklands road, and,
- The speed limit on Brooklands road is 50kph.

Alexandra Walk road is a cul-de-sac and provides access from the R403 to a number of residential developments. It is proposed to access the development via Alexandra Walk. The cross-section of Alexandra Walk access road is as follows:

- 6m wide carriageway;
- 2m wide footpaths with a 1m wide grass verge are located on either side of the carriageway;
- Street lighting is provided along Alexandra Walk access road, and,
- The speed limit on Alexandra Walk access road is 50kph.

The R403 is a regional road which travels in an east to west direction. To the east the R403 links Clane with Celbridge and to the M4, to the west the R403 links with other small and medium towns such as Prosperous and Allenwood. The R403 has the following characteristics at the location of the access onto Brooklands road:

- 6.5m wide carriageway;
- 2m wide footpaths are located on the north and south sides of the carriageway. The footpaths provide pedestrian access to Clane and other surrounding residential developments;
- Street lighting is provided along the R403, and,
- The speed limit on the R403 is 50kph.

Road Collisions

Information on road collisions was taken from the Road Safety Authority website and is provided in Figure 10.2 overleaf.

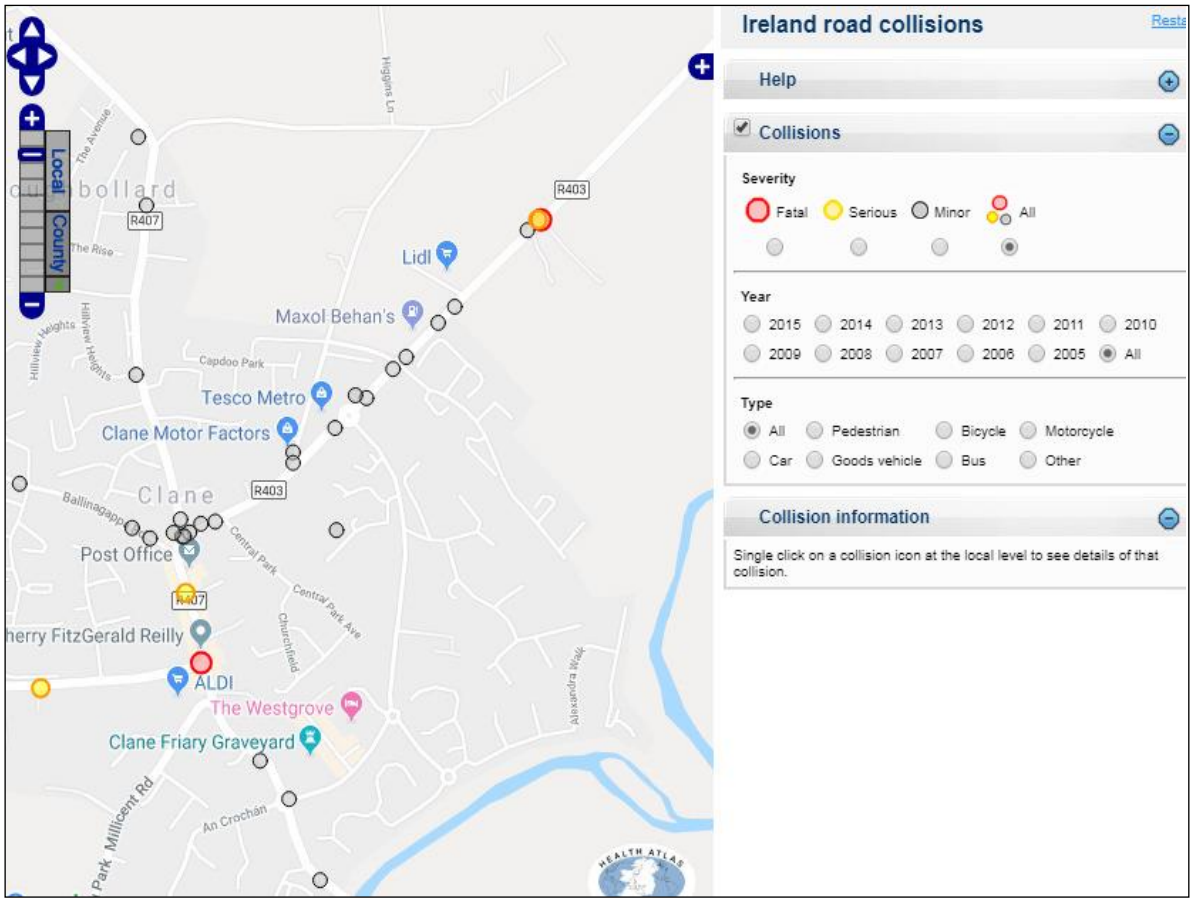

Figure 10.2 Road collision data.

There have been two minor collisions at the R403 / Brooklands / Capdoo Park crossroads junction in the period of eleven years (from 2005 to 2015). There are no collisions recorded along Brooklands access road or at the existing R403 / Alexandra Walk / The Avenue roundabout.

Proposed Road Network Improvements

The Kildare County Development Plan 2017-2023 has identified two locations along the R403 for road improvement works, ''County boundary at Backweston to Clane via Celbridge and Clane to Junction with R402 via Prosperous, Allenwood & Derrinturn''. However, it is not expected that these improvements would have a significant bearing on the proposed Development.

Other Proposed Developments in the Clane Area

There are lands to the northwest of the proposed Development Site which are also zoned residential and are in the ownership of Ardstone Homes. Access to this potential future development (granted permission ABP-304632-19) will also be via the existing R403/Brooklands/Capdoo Crossroads. It is understood that the proposed Development by Ardstone Homes will consist of 366 units in total (184 houses and 182 apartments).

As part of the Ardstone residential development it is proposed to provide a relief road through the development which will provide a connection from the R407 / L5078 priority junction to the R403 / Brooklands / Capdoo Park crossroads. The proposed relief road will have an impact on the travel pattern of traffic using the network surrounding Clane town. The alignment of the relief road and the location of Ardstone development is shown on Figure 10.3 overleaf.

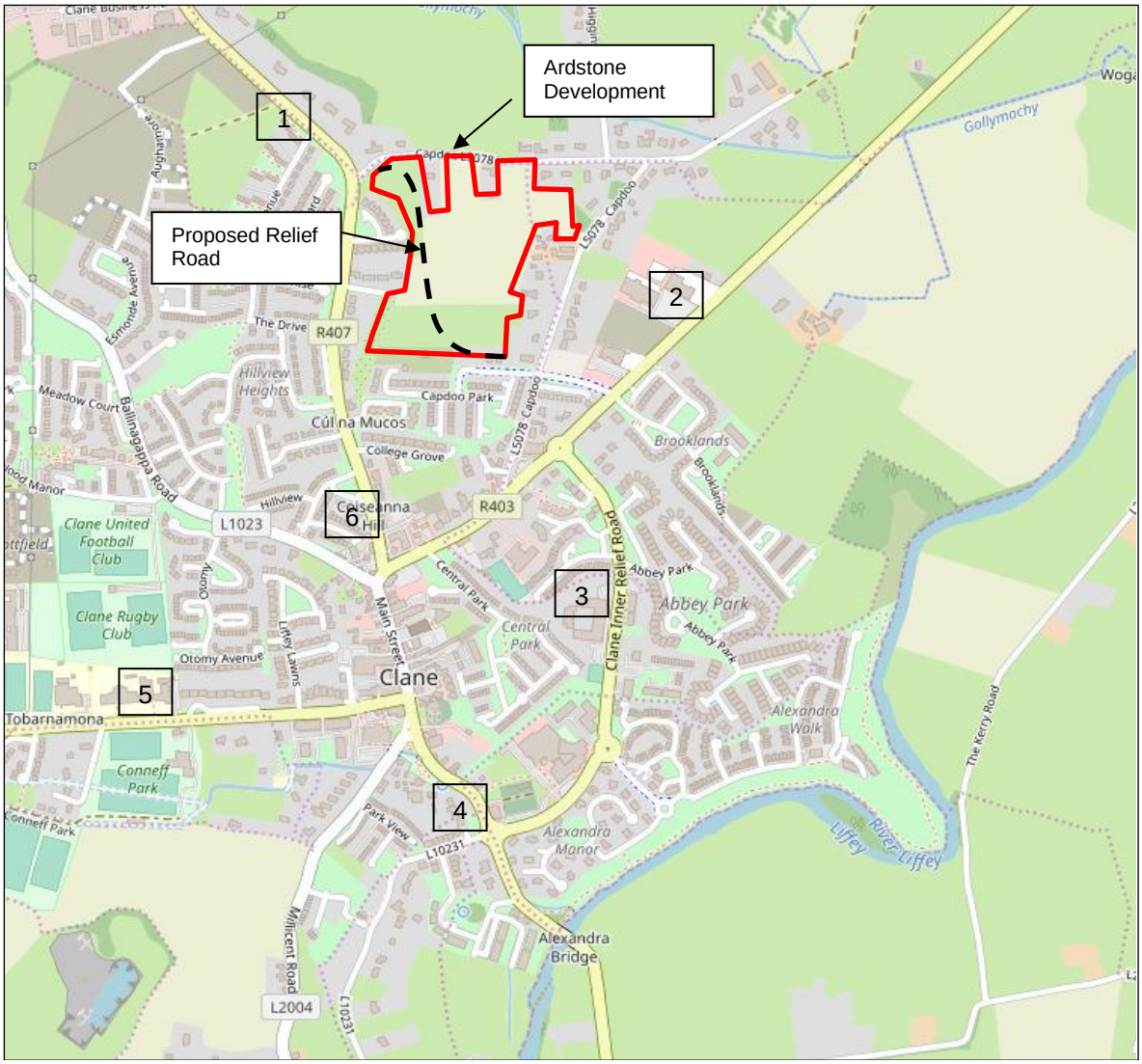

Figure 10.3 Proposed Ardstone development location.

As the relief road will affect existing traffic patterns in the Clane Area, an origin / destination survey was carried out. The origin / destination survey was carried out over a 3- day period from the 5th March 2019 to the 8th March 2019. Data was collected from 6 number origin / destination points as shown on Figure 10.2. The survey results are contained in Appendix 10.1, Appendix B – Traffic Surveys. In addition to the above a 12-hour baseline traffic count was carried out at each of the 6 locations. The origin/destination percentage splits for the 6 sites are indicated in Table 10.5 below:

Origin/ Destination	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Site 1	-	10	9	34	7	40
Site 2	7	-	25	28	23	17
Site 3	9	55	-	21	4	11
Site 4	24	42	12	-	10	12
Site 5	9	52	4	22	-	13
Site 6	33	26	7	22	12	-

Table 10.5 Origin/destination splits (All values as %).

10.2.2 Characteristics of the Proposed Development

The proposed Development consists of 112 houses, 34 duplex units, 159 apartments and a creche covering 340m^2. The proposed layout in shown on Drawing 18002-301. Access to the proposed Development will be via the existing R403/Brooklands/Capdoo Park cross-roads and the R403/Alexandra Walk/The Avenue roundabout. Refer to Figure 10.1 in Section 10.2.1. above.

The proposed Development is expected to be fully completed within 5 years of receipt of planning permission. For the purposes of assessment, the final completion date is envisaged as 2022.

Construction Phase

Site development and construction phase traffic will be routed through the existing Brooklands residential development onto the Dublin Road (R403) via the R403/Brooklands/Capdoo Park Crossroads.

HGVs accessing the proposed Development Site will be greatest during the delivery of stone with up to 40 trucks moving to and from the site per day. However, as the development is phased, this is only expected to occur over a maximum period of 2 weeks during each phase.

Outside of that period the number of HGV movements into and out of the site during each development phase is expected to reduce significantly to 15 – 20 HGVs on busy days and 5 – 10 HGVs on quiet days.

A development of this type and scale would on average necessitate approximately 30 - 40 staff on site at any one time, subsequently generating no more than 10 - 15 two-way vehicle trips during the peak AM and PM periods over the period of the construction works, (construction workers will use shared transport). On-site employees will generally arrive before 08:00, thus avoiding the morning peak hour traffic. These employees will generally depart after 16:00. Parking will be provided on site for construction employees.

Operational Phase

Development Trip Generation

The TRICS database has been used to predict the trip generation to and from the proposed Development for the AM and PM peak periods. Full details of the TRICS information used for the assessments are provided in Appendix 10.1, Appendix D - TRICS information.

Houses

The category of “Residential / Houses Privately Owned” has been interrogated as the most appropriate development type category for this part of the proposed Development and the trip rates for the AM and PM peak periods are shown overleaf.

Period	Trip Rate to Development	Trip Rate from Development
AM Peak	0.2	0.4
PM Peak	0.45	0.27

Table 10.6 Trip rates per number of units.

For the proposed 142 residential dwellings with access onto Brooklands road this would give the following trips to and from the Proposed Development:

Period	Trip Rate to Development	Trip Rate from Development
AM Peak	29	58
PM Peak	66	39

Table 10.7 Trip generation 146 units.

Apartments

The category of "Residential / Flats Privately Owned" has been interrogated as the most appropriate development type category for this part of the proposed development and the trip rates for the AM and PM peak periods are shown below:

Period	Trip Rate to Development	Trip Rate from Development
AM Peak	0.05	0.15
PM Peak	0.12	0.07

Table 10.8 Trip rates per number of units.

For the proposed 158 apartments with access onto Brooklands road this would give the following trips to and from the proposed development:

Period	Trip Rate to Development	Trip Rate from Development
AM Peak	8	24
PM Peak	19	11

Table 10.9 Trip generation 159 apartments.

Crèche

The category of "Education / Nursery" has been interrogated as the most appropriate development type category for this part of the proposed development and the trip rates for the AM and PM peak periods are shown below:

Period	Trip Rate to Development	Trip Rate from Development
AM Peak	5.93	4.11
PM Peak	2.99	3.22

Table 10.10 Trip rates per number of units.

For the proposed Crèche of 340sqm with access onto Brooklands road this would give the following trips to and from the proposed development:

Period	Trip Rate to Development	Trip Rate from Development
AM Peak	20	14
PM Peak	10	11

Table 10.11 Trip generation 340 sq.m.

The trip generation summary is shown in Table 10.12 below:

	Trip Rate to Development	Trip Rate from Development	Total
AM Peak	57	96	153
PM Peak	95	61	156

Table 10.12 Trip generation summary for proposed development.

Trip Distribution

The access to the proposed Development will be via the existing R403 / Brooklands / Capdoo Park crossroads and the existing R403 / Alexandra Walk / The Avenue roundabout. An origin / destination survey was carried out over a 3-day period from the 5th March 2019 to the 8th March 2019 by ROADPLAN Consulting The survey indicated that percentage of existing traffic arriving and departing to and from Clane are as follows:

- 23% to / from the R407 Kilcock direction
- 34% to / from the R403 Celbridge direction
- 28% to / from the R407 Sallins direction
- 15% to / from the R403 Prosperous direction

Using the above data, it is assumed that the development traffic will distribute as follows:

- 57% of the development traffic will arrive / depart via the R403 / Brooklands / Capdoo Park crossroads, and,
- 43% of the development traffic will arrive / depart via the R403 / Alexandra Walk / The Avenue roundabout.

Section 4.2 of the TIA contained in Appendix 10.1, illustrates the existing and proposed distribution percentage for the AM and PM peak at the existing R403 / Brooklands / Capdoo Park crossroads, and the R403 / Alexandra Walk / The Avenue roundabout. Using the proposed directional splits and the trips generated by the proposed Development outlined above, Section 4.2 of the TIA also illustrates diagrams showing the turning movements of the predicted Development and existing traffic combined at both junctions.

Car-Parking

The 'Kildare County Development Plan 2017-2023' lists standard provision for car parking and the table below sets out those requirements in relation to the proposed Development.

Parking Standards for Residential Development			
Land-Use	**Requirements**	**Quantity**	**Parking**
Residential Dwellings	2 spaces per unit	146 dwellings	292
Apartments	1.5 spaces per unit+1visitor space per 4 apartments	159 apartments	278
Creche	0.5 per staff member plus 1 per 4 children	25 children + 5 staff	9
Total			**579**

Table 10.13 Car parking requirements from the Kildare County Development Plan 2017 - 2023.

The Kildare County Development Plan indicates that the number of parking spaces required is 579 parking spaces. The number of parking spaces required for the 159 apartments was also assessed using the "Design Standards for New Apartments – Guidelines for Planning Authorities 2018". The "Design Standards for New Apartments – Guidelines for Planning Authorities 2018" indicates that 1 car space per unit together with an element of visitor parking, such as 1 space for every 3-4 apartments should generally be required. Therefore, using the above requirements, Table 10.14 below sets out those requirements in relation to the proposed 158 apartments.

Parking Standards for Residential Development			
Land-Use	**Requirements**	**Quantity**	**Parking**
Apartments	1 space per unit+1visitor space per 4 apartments	159 apartments	199
Total			**199**

Table 10.14 Car-parking requirements from the 'Design Standards for New Apartments – Guidelines for Planning Authorities 2018'.

In summary, the Kildare County Development Plan indicates that 292 parking spaces are required for the residential dwellings and the Design Standards for New Apartments – Guidelines for Planning Authorities, 2018 indicates that 199 parking spaces are required for the apartments giving a total requirement of 491 parking spaces. A total of 553 parking spaces are to be provided within the proposed Development.

Cycle Parking

Kildare County Council has also published cycle parking guidelines contained with County Development Plan 2017-2023. The Plan sets out the following requirements:

Apartments: 1 space per unit + 1 visitor space per 2 units; and
Crèche – 1 space per 5 staff members plus 1 per 10 children.

It is noted that each of the proposed 'housing' units benefit from being designed with access to their rear gardens. Accordingly, the opportunity is available for residents of the 146 houses to store their bicycles in their own secure back garden.

The development proposes for a total of 508 no. dedicated cycle parking spaces for the apartments and crèche which meets the requirements outlined within the Kildare County Council development standards.

Road Safety, Pedestrians and Internal Layout

Road Safety

The Design Manual for Urban Roads and Streets indicates that for a 50km/h speed limit a sightline of 45m at a 2m set-back shall be achieved in both directions.

At the proposed residential access and at the proposed creche access onto Brooklands access road a 45m sightline at a 2m set-back can be achieved in both directions. The visibility splay to the north and south of the proposed accesses is measured from a 2m set-back to the nearside kerb of the road.

Pedestrians

A 2m wide footpath will be provided internally to cater for pedestrian movement within the development. The proposed internal footpaths within the development will connect to the existing footpath located on Brooklands access road and the existing footpaths located on Alexandra Walk access road.

Cyclists

Cyclists will access the proposed development via the same access points as pedestrians. Dedicated off-road cycle facilities will be provided as detailed above.

Internal Layout

Within the development the spine road is 6m wide.

Parking is provided for each residential dwelling. Parking for Apartments is located adjacent to each apartment block. Parking bays are 2.5m wide x 5m long.

HGV access to the proposed Development will be via the proposed access onto Brooklands access road and via Alexandra Walk. The types of HGV's accessing the site would be emergency vehicles and a bin lorry. The internal layout can facilitate HGV movement within the site.

10.2.3 Potential Impact of The Proposed Development

The potential impacts associated with the proposed Development are outlined as follows:

- During the site development and construction phases, mud and dirt may be deposited on the local road network;
- Temporary safety and traffic disruption issues may potentially arise as a result of construction phase activities and traffic movements;
- In the long term, the proposed Development may result in impact on traffic flows and junction performance due to increased traffic arising from the Development alone and, cumulatively with other proposed schemes in the Clane area and expected growth in existing baseflow.

10.2.4 Impact Assessment

Construction Phase

The likely impact of the construction works on the surround road network will be short-term slight negative in nature.

The number of staff on site will fluctuate over the implementation of the subject scheme. Nevertheless, based upon the experience of similar projects, it would be expected that approx. 30 - 40 staff will be on site at any one time, subsequently generating low levels of two-way vehicle trips during the peak AM and PM periods over the period of the construction works (construction workers will use shared transport). On-site employees will generally arrive before 08:00, thus avoiding the morning peak hour traffic. These employees will generally depart after 16:00.

During construction, deliveries will occur and are likely to arrive at a steady rate spread out during the course of each day. Inert fill material will be required during site development works for each phase. It is estimated that up to 40 HGV movements per day may occur during the importation of fill however this is expected to occur over a 2-week period during each phase and therefore will be brief to temporary in nature. The proposed haul routes will avoid the centre of Clane town.

Existing spoil material and spoil generated from earthworks, service trenching and excavation of foundations will be retained on-site and therefore will not necessitate movement off-site.

Overall, it is considered that the impact during the construction phase with all the above considered will at most have a short-term slight negative effect on the surrounding network however, with further mitigation as detailed under Section 10.2.5., this is likely to reduce to imperceptible effect in Clane Town Centre and key traffic corridors into the town.

Operational Phase

Traffic generated by the proposed Development will have some effect on the local road network surrounding the proposed Development Site. The two junctions likely to be affected are:

- R403/Brooklands/Capdoo Park Crossroads, and,
- R403/Alexandra Walk/The Avenue Roundabout.

Capacity assessments for each of the existing junctions have been undertaken by ROADPLAN Consulting using the computer programme PICADY for the AM and PM peak hours. The following scenarios have been modelled:

- Existing Base Flows;
- 2022, 2027 and 2037 with Development.

The above have been assessed taking account of future year traffic growth also. In this regard, TII issues a range of forecasts: low growth, medium growth and high growth. The implementation of policies relating to Smarter Travel and to public transport will act a deterrent to high growth in car-based travel. Low growth factors are however likely to be equally unrealistic at present in the Clane Area, the medium growth factors were used in the assessment. The zone in which the site is located is numbered 494 in the TII National Traffic Model. The growth factors are as follows:

Zone	2019 Existing	2022 Development Completion	2027 5 Years after Development Completion	2037 15 Years After Development Completion
494	1	5.88	16.49	27.18

Table 10.15 Future year traffic growth factors (All values as %).

In addition, ROADPLAN Consulting considered and assessed the potential cumulative impact of the proposed Development with the Ardstone Homes proposed Development and proposed relief road

impact on the travel pattern of traffic using the network surrounding Clane town. In this regard, Design Year 2037 with Development + Sensitivity Flows was assessed. Further detail is provided below.

Sensitivity Testing of Possible Future Development

With the relief road in place it is assumed that all vehicle trips travelling from site 1 to sites 2 and 3 as shown on Figure 10.2 will divert via the relief road and all vehicle trips travelling from sites 2 and 3 to site 1 will divert via the relief road. In addition, it is assumed that 40% of vehicles trips travelling to / from site 1 to site 4 will divert via the relief road.

Using the percentage splits shown in Table 10.5 above it is assumed that 33% (10% + 9% + 14%) of the existing vehicle trips originating from site 1 will divert via the relief road and 26% (7% + 9% + 10%) of the existing vehicle trips originating from site 2, 3 and 4 will divert via the relief road.

Using the baseline traffic counts carried out at site 1 and the percentage splits shown above the predicted two-way flow of background traffic that will travel via the relief road during the AM and PM peak hours are indicated in the table below:

	Northbound	**Southbound**
AM Peak	89	88
PM Peak	97	95

Table 10.16 Proposed relief road – diverted trips.

In addition to determining the diverted trips, ROADPLAN Consulting also interrogated the TRICS database to assign trip generation to the proposed Ardstone Development based on 366 units. The same trip rates were used as per Tables 10.6 and 10.8 above.

The total trip generation summary is provided in Table 10.17 below:

	Trip Rate to Development	**Trip Rate from Development**	**Total**
AM Peak	46	101	147
PM Peak	105	63	168

Table 10.17 Trip generation summary for Ardstone development.

The construction of the proposed relief road as part of the Ardstone residential development will result in a re-distribution of the proposed residential flows associated with the Brooklands development. Section 4.3 of the TIA in Appendix 10.1 contains diagrams illustrating the proposed traffic distribution percentage for the AM and PM peak at the existing R403 / Brooklands / Capdoo Park crossroads in 2037 when the proposed relief road and the Ardstone residential development are operational.

Section 4.3 of the TIA in Appendix 10.1 also contains diagrams illustrating the turning movements of the predicted development traffic at the R403/Brookland/Capdoo Park crossroads during the AM and PM peak hours using the proposed Development splits and including trips generated by the proposed Ardstone Development also.

Full summary tables and predicted future traffic flows for 2022, 2027 and 2037 future years at each junction during AM and PM peaks are included in Appendix 10.1, Appendix C – Traffic Flow Sheets.

Results of Assessment – Operational Phase

Section 5 of Appendix 10.1 contains tables summarising the existing situation and the effects that the proposed Development will have on the junctions in 2022, 2027 and 2037 using the existing and predicted traffic flows shown in Appendix 10.1, Appendix C – Traffic Flow Sheets. Full PICADY printouts are provided in Appendix 10.1, Appendix E – PICADY Results.

In summary, the tables indicate the following:

Year	R403/Brooklands/Capdoo Park Crossroads	R403/Alexandra Walk/The Avenue Roundabout
Existing Base Flows AM Peak	No queues, minimal delays.	Minimal queues and delays.
Existing Base Flows PM Peak	No queues, minimal delays.	Minimal queues and delays.
AM Peak – 2022 with Development	Minimal queues and small delays.	Minimal queues and delays.
PM Peak – 2022 with Development	Minimal queues and small delays.	Minimal queues and delays.
AM Peak – 2027 with Development	Minimal queues and small delays.	Minimal queues and delays.
PM Peak – 2027 with Development	Minimal queues and small delays.	Minimal queues and delays.
AM Peak – 2037 with Development	Minimal queues and small delays.	Small queues and delays.
PM Peak – 2037 with Development	Minimal queues and small delays.	Small queues and delays.
AM Peak – 2037 with Development + Sensitivity Flows	Junction will operate at its ultimate capacity with queues and delays.*	N/A
PM Peak – 2037 with Development + Sensitivity Flows	Junction will operate within capacity with some queues and delays.	N/A

Table 10.18 Summary junction assessment *It should be noted that the junction reaches its ultimate capacity for a 15-minute time period only (08.00 – 08.15) with the junction operating within capacity during the remainder of the AM peak period.

In addition to the above, ROADPLAN Consulting also undertook a capacity assessment at the R403/Brooklands/Capdoo Park under a scenario whereby the junction is upgraded to a signalised junction. The computer programme TRANSYT for the AM and PM peak hours was used to determine operational performance of the upgraded junction. Section 5.4 of the TIA contained in Appendix 10.1 summarises the effect of the proposed Development and the Ardstone Development on this junction in 2037 using the existing and predicted traffic flows shown in Appendix 10.1, Appendix C. The assessment indicates that upgrading the existing R403/Brooklands/Capdoo Park crossroads to a signalised junction will result in the junction being at capacity with queues and delays during the AM peak hours with the proposed Development operational in 2022, 2027 and 2037.

Similarly, sensitivity testing of the proposed Development, with the Ardstone residential development and the relief road open indicates that upgrading of the existing R403 / Brooklands /Capdoo Park crossroads to a signalised junction will result in the junction being at capacity with queues and delays at the junction during the AM peak hour in 2037.

10.2.5 Avoidance, Remedial and Mitigation Measures

Construction Phase

Construction activities will be governed by a Construction Traffic Management Plan (CTMP) the details of which will be agreed with the local Roads Authority prior to the commencement of construction activities on-site. The principal objective of the CTMP is to ensure that the impacts of all building activities generated during the construction of the proposed Development upon both the public (off-site) and internal (on-site) workers environments, are fully considered and proactively managed / programmed respecting key stakeholders requirements thereby ensuring that both the public's and construction workers safety is maintained at all times, disruptions minimised and undertaken within a controlled hazard free / minimised environment.

The haul routes within the site development phase will be built up at the outset thus minimising carry-over of mud on HGVs to the adjoining road network. Dust suppression and vehicle wheel-wash facilities will also be implemented during the site development and construction phases to further minimise mud build-up on the access route through Brooklands and R403.

Operational Phase

No specific additional mitigation measures are proposed during the operational phase of development.

10.2.6 Predicted Impact of the Proposed Development

Construction Phase

With the CTMP in place, it is envisaged that the construction phase will have an imperceptible effect in Clane town centre and on the local road network.

Operational Phase

Junction analyses to assess the effects of traffic generated by the proposed Development have been undertaken for the existing R403 / Brooklands / Capdoo Park crossroads and the existing R403 / Alexandra Walk / The Avenue roundabout. The analysis shows that:

- The existing R403 / Brooklands / Capdoo Park crossroads currently operates within capacity with minimal delays and queues during the AM and PM peak hours.
- The existing R403 / Brooklands / Capdoo Park crossroads will continue to operate within capacity with small queues and delays when the proposed Development is completed in 2022, year of opening, 2027, five years after opening and in 2037, fifteen years after opening.
- Sensitivity testing of the proposed Development, the Ardstone residential development with the relief road open indicates that the existing R403 / Brooklands / Capdoo Park crossroads will operate at its ultimate capacity with queues and delays during the AM peak period. In the PM peak period, the junction will operate within capacity with some queues and delays in 2037. In the AM peak period the junction reaches its ultimate capacity for a 15-minute time segment only (08:00 to 08:15) with the junction operating within capacity during the remainder of the AM peak period.
- The existing R403 / Alexandra Walk / The Avenue roundabout currently operates within capacity with minimal delays and queues during the AM and PM peak hours.
- The existing R403 / Alexandra Walk / The Avenue roundabout will continue to operate within capacity with small queues and delays when the proposed Development is completed in 2022, year of opening, 2027, five years after opening and in 2037, fifteen years after opening.
- Upgrading of the existing R403 / Brooklands / Capdoo Park crossroads to a signalised junction will result in the junction being at capacity with queues and delays at the junction during the AM and PM peak hours with the proposed residential development operational in 2022, 2027 and 2037.
- Sensitivity testing of the proposed Development, the Ardstone residential development with the relief road open indicates that upgrading of the existing R403 / Brooklands / Capdoo Park crossroads to a signalised junction will result in the junction being at capacity with queues and delays at the junction during the AM and PM peak hours in 2037.

10.2.7 Monitoring and Reinstatement

Not applicable.

10.2.8 Cumulative Impacts

Cumulative impacts with regard to traffic generation and impact on the existing road network have been considered in Section 10.2.4 above.

10.3 Energy Networks & Telecommunications

10.3.1 Receiving Environment

Electricity

An ESB Networks plan is included in Appendix 10.2 showing the location of existing electrical services in the vicinity of the site.

An existing MV overhead line runs along the northern boundary of the site from the R403 to the west to development to the east across the River Liffey. This line serves the applicant's residence to the northwest.

An existing MV/LV underground line enters the site from Brooklands and runs along the western site boundary to the northern boundary where the overhead line is located.

Gas

Gas Networks Ireland plans are included in Appendix 10.3 showing the location of medium pressure gas distribution pipes in the vicinity of the site in Alexandra Walk and Brooklands.

Telecommunications

Eir network plans are included in Appendix 10.4 showing the location of telecommunications infrastructure in the vicinity of the site in Brooklands.

Telecommunications infrastructure is located along the R403 road to the west of the site, with the housing developments to the south and west the site containing numerous telecommunications cables.

10.3.2 Characteristics of the Proposed Development

Power supply for the proposed Development will be taken from the existing ESB Network. Existing overhead power lines within the site (MV 10kV / 20 kV) will be relocated in advance of commencement of site works.

Gas supply for the proposed Development (if required as part of the energy strategy) will be taken from the existing Gas Networks Ireland network located to the west of the site. The existing Eir network located to the west of the site will be extended to service the proposed Development.

10.3.3 Potential Impacts of the Proposed Development

Potential impacts that may arise during the construction phase include:

- Damage to existing underground and over ground infrastructure.
- Relocation or diversions to existing overhead ESB lines may lead to loss of connectivity to and / or interruption of supply from the electrical grid.
- Potential loss of connection to the Gas Networks Ireland and Telecommunications infrastructure while carrying out works to provide service connections.

No potential impacts are expected during the operational phase as there is adequate supply to service the proposed Development demand.

10.3.4 Avoidance, Remedial and Mitigation Measures

Construction Phase

A site-specific CEMP will be developed and implemented during the construction phase. Implementation of the measures outlined in this plan will ensure that the potential impacts of the proposed Development do not occur during the construction phase. Relocation of existing overhead ESB lines will be fully coordinated with ESB Networks to ensure interruption to the existing power

network is minimised (e.g. agreeing power outage to facilitate relocation of cables). Ducting and / or poles along the proposed relocated route will be constructed and ready for rerouting of cables in advance of decommissioning of existing overhead power lines.
Similarly, connections to the existing gas and telecommunications networks will be coordinated with the relevant utility provider and carried out by approved contractors.

Operational Phase

No monitoring is proposed during the operational phase.

10.3.5 Predicted Impact of the Proposed Development

Implementation of measures outlined in Section 10.3.4 above will ensure that the potential impacts of the proposed Development on service infrastructure during the construction phase do not occur and that any residual negative impacts will be brief in nature.

Demand from the proposed Development during the operational phase is not predicted to impact on the existing power, gas and telecoms network.

10.3.6 Monitoring and Reinstatement

No specific monitoring is proposed in relation to electrical, gas and telecommunications infrastructure.

Reinstatement of any excavations, trenches etc. relating to the provision of electrical, gas and telecommunications connections is to be carried out in accordance with the relevant utility provider's requirements.

10.3.7 Cumulative Impacts

None. Construction stages involving service connections associated with the proposed Ardstone Development to the northwest is not likely to coincide with the same works at the proposed Development. Notwithstanding this, both developments will follow Construction and Environment Management Plans.

There is adequate capacity to serve both developments within the gas, electricity and telecommunications networks.

11.0 ARCHAEOLOGICAL, ARCHITECTURAL AND CULTURAL HERITAGE

11.1 Introduction

This report provides a Cultural Heritage Assessment of the proposed development of lands at Abbeylands and Capdoo, Clane, Co. Kildare.

The report was prepared by Martin Byrne, Byrne Mullins & Associates, who has in excess of 30 years' experience in preparing Archaeological and Cultural Heritage Assessments. Martin Byrne holds a BA (UCC) in Archaeology and History and an MA (UCC) in Archaeology, together with a Diploma in EIA Management (UCD) and was a member of the National Monuments Service Expert Advisory Committee (2009-2010) tasked with reviewing the proposed National Monuments (Consolidated) Act with respect to the area of Monument Protection and to bring forward proposals for associated statutory regulations; he is founding Board Member and former Chairperson of the Institute of Archaeologists of Ireland (IAI) and represented the IAI on the Royal Irish Academy Standing Committee for Archaeology (2014-2018). He is currently a company member of The Discovery Programme – Centre for Irish Archaeological Research, representing the IAI.

Cultural Heritage is defined by UNESCO as "the legacy of physical artefacts and intangible attributes of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations" (www.unesco.org/new/en/cairo/culture/tangible-cultural-heritage). In terms of the present project, Cultural Heritage is assumed to include all humanly created features on the landscape, including portable artefacts, which might reflect the prehistoric, historic, architectural, engineering and/or social history of the area.

11.1.1 Definition of Study Area

The subject development lands (red-line boundary) and an area of 500m surrounding such lands were determined to be the Study Area for Cultural Heritage. The extent of the Cultural Heritage Study Area was chosen to reflect an appropriate context for the development, beyond which it was considered that a development of this nature would have no direct/indirect impacts.

11.2 Research Methodology

The overall Cultural Heritage components of the study comprise the results of a survey and evaluation of sites of archaeological and architectural heritage architectural potential within, and in the immediate environs of, the proposed development area, together with historical research of the subject area and environs. The work consists of the results of a paper survey, field inspection and programme of archaeological testing.

11.2.1 Paper Survey

As part of a documentary/cartographic search, the following principal sources were examined from which a list of sites and areas of Cultural Heritage interest/potential was compiled:

- Record of Monuments and Places – Co. Kildare (RMP)
- Sites and Monuments Record of the Archaeological Survey of Ireland (SMR) – www.archaeology.ie
- Topographical Files of the National Museum of Ireland
- Annual Archaeological Excavations Bulletin – www.excavations.ie
- Aerial Photographic & Cartographic Archive of the Ordnance Survey of Ireland – www.osi.ie
- National Inventory of Architectural Heritage (NIAH) – www.buildingsofireland.ie
- Placenames Commission – www.logainm.ie
- Documentary and cartographic sources in Kildare County Library (see Section 11.9)
- Kildare County Development Plan 2017 – 2023 (KCDP)

- Clane Local Area Plan 2017 – 2023 (CLAP)
- Heritage Council Heritage Maps – www.heritagemaps.ie
- National Folklore Collection (The School's Collection) – www.duchas.ie

11.2.2 Field Inspection

Following completion of the preceding paper survey, a preliminary field survey was undertaken late-June 2019. This entailed a surface reconnaissance of the subject lands and inspections of the surrounding lands, where possible. A further, more detailed surface reconnaissance of the subject lands was undertaken in early August 2019.

11.2.3 Archaeological Testing

A programme of archaeological testing of the subject proposed development lands was undertake from 12th – 16th August 2019, under licence (Ref; 19E0500) from the Department of Culture, Heritage and the Gaeltacht. The results of the testing are discussed below in Section 11.3.2.4 and presented in Appendix 11.1.

11.2.4 Difficulties Encountered

No significant difficulties were encountered with respect to the preparation of the Paper Survey, Field Survey of Programme of Archaeological Testing. The southernmost field includes a number of spoil mounds and areas of construction material storage, together with high grass but this did not impede the research work.

11.3 Archaeological, Architectural and Cultural Heritage

11.3.1 Local Historical Background

The subject development lands form parts of the townlands of Abbeyland and Capdoo in the civil parish and barony of Clane (O.S. 6-inch map: Kildare Sheet 14). The name Abbeyland refers to lands belonging to the (former) Abbey of Clane, while Capdoo is considered to be an English name for which its Irish form has yet to be confirmed, although it is possible that it may derive from *Ceapa Dubh* – the 'black plot' (Placenames Commission – www.logainm.ie).

A large bullaun stone located in the village is said, according to Costello (1991, 45), to mark the traditional burial place where Mesagra, a first century king of Leinster, was slain in single combat by the champion of Ulster. It is also believed in local tradition that St. Patrick came to Clane to baptise the people in the well which he blesses. Known as Sunday's Well, it was traditionally visited on that day and patrons were held there until the nineteenth century.

The earliest permanent settlement was an Early Christian church site. Gwynn and Hadcock (1970, 31) identify Clane as the location of the monastery of *Cluain Damh*, founded by St. Ailbe, of which St. Senchall (d. 549 A.D.) was the first abbot. It appears that Clane was an important settlement by the 12th century as it was the venue for a synod, convened by Archbishop Gelasius of Armagh, in 1162.

A Franciscan Friary, known locally as Clane Abbey, was established at Clane in *c.* 1258. It is likely that this friary was founded by Gerald Fitz-Maurice (Fitzgerald, Lord of Offaly) and, according to Gwynn and Hadcock (1970, 245), "he is said to have been buried in the friary on 1287". In 1345 a general chapter, held at the friary, made important decisions about Irish custodies. In 1433 an indulgence was granted as the establishment was in need of repair. However, following the dissolution of the monasteries, portions of the friary – including the church, chancel and part of the dormitory – were destroyed by order of Lord Leonard Grey, late King's Deputy, for the purpose of repairing the king's castle at Maynooth. Fragments of the nave, chancel and south aisle still survive today in a rectangular graveyard south-east of the village, and the mutilated effigy in the remains is said to be of Gerald Fitz-Maurice.

Although Clane had been established as a borough by the end of the 13th century, it was burned in 1310 and this may have led to its temporary abandonment. While the present street pattern may follow medieval lines, there are no clear burgage-plot patterns. Indeed, there are strong indications that the borough was deserted by the end of the Middle Ages. However, according to Bradley (1987, 151), "a reference to the 'New Town of Clane' suggests that the borough was re-established during the sixteenth century". Indeed, the 1659 census of Ireland recorded a population of 58 for Clane. The re-establishment is reflected in the Burgage-plot patterns in the broader northern area of the Main Street, where their regularity suggest a 17th or 18th century date.

Following the Anglo-Norman invasions, Strongbow conquered the Kingdom of Leinster. Clane at the time was in the Celtic tuatha of Otomy. Much of North Kildare was granted to de Hereford, one of his principal followers. This Norman lord then re-granted much of the area surrounding Clane to his brother Richard de Hereford. A motte, located to the south of the village, was probably constructed in the late 12th century by the de Herefords. Richard de Hereford was created a baron, and he chose Clane as the central settlement of his barony.

The former parish church of St. Michael's, located in a sub-circular churchyard in the centre of the village, is the site of a church held by the Knights Hospitallers during the Middle Ages, and first referred to in 1212 in Innocent III's confirmation of their churches in Ireland. It was first described as a parish church in 1307.

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The Civil Survey (aka Down Survey) Map of 1655-6 (Figure 11.1) illustrates the extent of the parish of Clane (*Claine)* at that time. The accompanying 'terrier' to the map describes the barony of Clane thus: *'The land arable of ye aforesaid barony of Clane is good dry and fertile for Corne of all sortes. The pasturable ground is good for Cattle of all sortes and ye bog in som parts of the Barony is fitt for fireing. The River of Liffy is ye only River riseing out of or running through ye barony of Clane. There is in the aforesaid Barony of Clane soe Foords in the River of Liffy (viz) the foord of NEwtowne, the Foord of Caselekeely the foord of Cashunskealy, the ffoord of Aghglasshefae, Blackffoord and a Foord cald Aghvoddeveryren. There is in the said barony of Clane two mannors (vizt) the mannor of CLane and the Mannor of Tymachoe'.*

The townland of Abbeyland formed part of a landholding of the (Protestant) Abbey of Clane in 1641 and in 1670 were owned by Thomas Luttrell of Luttrellstown (www.downsurvey.tcd.ie); Capdoo is named as 'Keapock' at this time (Figure 11.2) and in 1641 William Sarsfield of Lucan held 236 acres, with Gerald FitzGerald, earl of Kildare, holding 12 acres (Simmington, 1952, 150); Sarsfield appears to have owned all the lands in Keapock by 1670 (www.downsurvey.tcd.ie).

The people of the town at the time enjoyed certain rights to property, which included the use of 100 acres of pasture that was held in common. A census of 1659 noted that the population of Clane included 54 English and 4 Irish, and that the 'titulados' were Henry Pearce, Patrick Fitzgerald and John Warren.

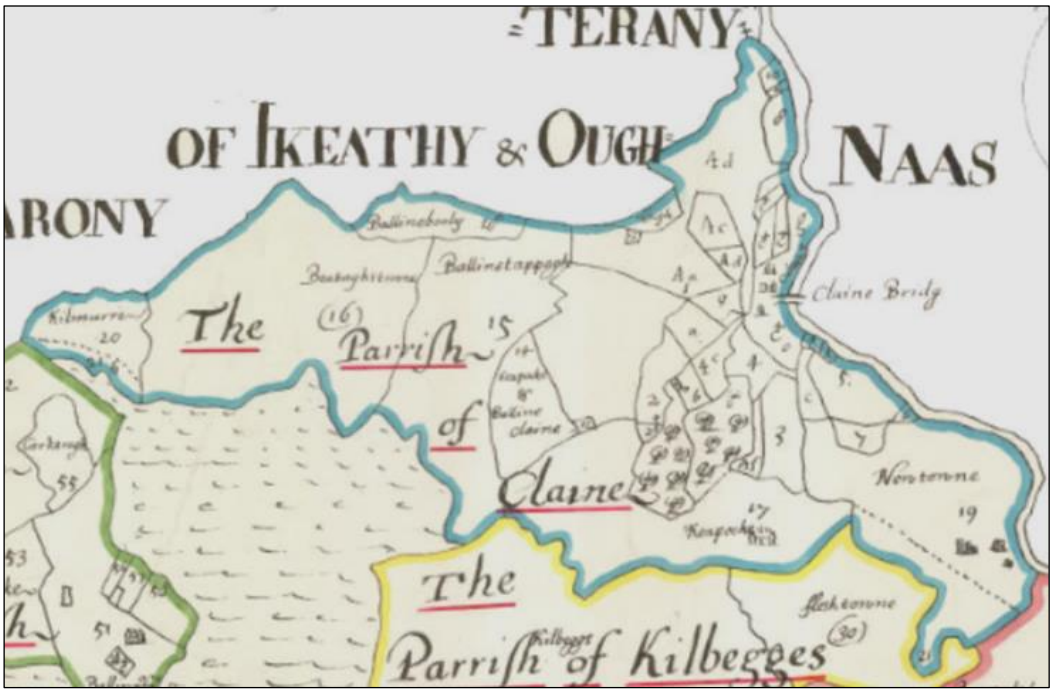

Figure 11.1 Extract from Civil or Down Survey Map (1655-6) illustrating parish of Clane.

Figure 11.2 Map of Clane (Clain) and environs – 1670.

Very little is known about Clane in the eighteenth century, during which time it lost its status as a market town. Noble & Keenan's map of 1752 (Figure 11.3) illustrates 'Cappock' (Capdoo), as well as a number of roads converging on the village, with a number of religious structures indicated within the centre. According to local tradition, a mass-house was constructed on Main Street in the eighteenth century. In 1766 Rev William Daniels the Vicar of Clane, compiled an account giving the number of families living in the Clane and Mainham areas. According to the report 182 Catholic families and 10 Protestant families resided in Clane civil parish (Comerford, 1886, Vol. 1, 274). Taylor's map of 1783 (Figure 11.4) indicates that the townland of Capdoo formed part of 'Cape-dow' Commons and that boundaries within such lands included some associated tree planting.

Figure 11.3 Extract from Noble & Keenan – 1752.

Figure 11.4 Extract from Taylor – 1783.

During the 'Rising' of 1798, at between 2:00 – 3:00am of the 24th May, around 300 rebels attacked the village of Clane, but were driven off by Captain Jepson's Armagh Militia and some of the local Clane yeoman cavalry. The yeomanry commander, Richard Griffith of Millicent, arrived around 3.15 am and took command. The combined military drove back a second rebel attack from the village. Some houses were burned by the soldiers and six prisoners were taken (4 were Griffith's tenants), one of whom was summarily executed. Some of the Armagh Militia had been piked to death in their private billets and at least three of Griffith's corps had deserted, but for the moment the town was secure. A third attack, around 5 am, was led by Rebels dressed in the uniforms, hats and helmets of the City of Cork Militia and Ancient Britons, whom they had defeated at Prosperous. Griffith and his men made a stand on the commons and dispersed them. The 16 yeoman cavalry then charged and routed them. Aware of the rebel victory at Prosperous and the large number of rebels in the locality, Griffith decided his position was untenable and retreated in good order to Naas. He was joined by his 1st Lieutenant, Dr. John Esmond, who had led the rebels in Prosperous. Griffith had learned of his treachery from Phil Mite, and on arriving at Naas he had Esmond arrested. The five prisoners taken in the second attack were hanged in Naas. Esmond was tried by court-marital and hanged as a traitor, with his yeoman coat turned out, on Carlisle Bridge, Dublin on the 14th June. The next day Griffith's estate at Millicent was attacked and plundered. William Aylmer and his men ambushed troops and yeomanry on the 4th, 5th and 6th of July near Clane.

Lewis (1837) noted that the civil parish of Clane had a population of 2121, with 1031 residing in the village. He remarked that the village was 'pleasantly situated on the river Liffey', over which was a bridge of six arches, and in 1831 comprised 225 houses neatly built; Woollen manufacture was carried on to a small extent and fairs, chiefly for the sale of cattle, sheep, and pigs, were held on March 28th, April 28th, July 25th and October. 15th and a constabulary police station had recently been established, with petty sessions held by the county magistrates every alternate Saturday. He further noted that the parish comprised 2380 statute acres, as applotted under the tithe act; the greater portion was under tillage, the soil was fertile, and the system of agriculture improved; there were quarries of good limestone, which were worked with success; and limestone, lime, and sand were sent to Dublin by the Grand Canal, which passes within two miles of the town. In addition, he noted that (Protestant) church, an ancient structure, had been lately modernised and kept in repair by a small estate called Economy Lands, producing about £60 per annum; the glebe-house was a handsome building with the glebe lands for the union comprising 29 acres. He described the recently constructed Catholic church as a plain cruciform building in good repair; the parochial school was maintained by subscription among the Protestant inhabitants, with the stone school-house erected at an expense of £300, while the Roman Catholic free school, under the National Board of Education, was built in 1819, at an expense of £300.

The Ordnance Survey map of 1837 (Figure 11.5) indicates that the subject proposed lands (outlined in purple) were in agricultural use at this time, with some planted field boundaries. The townland boundaries within, and in the environs of, the subject lands (marked red) are illustrated; these comprise a boundary between Capdoo and Capdoo Commons (CH-1A) along the westernmost extent of the subject proposed development lands (Fields 1 & 3), together with a section at the south-western extent of Field 4; between Abbeyland and Capdoo along a section of the northern extent of Field 2 and shared boundaries of Field 2 with Field 1 and Field 4 (CH-1B); and a section of the southern boundary of Field 4 (CH-1C) between Abbeyland and Capdoo and Abbeyland and Glebe. These are further indicated in Figure 11.8, In addition, the River Liffey, along the easternmost extent, acts as a townland, civil parish and barony boundary.

In general, boundaries CH-1A (Capdoo/Capdoo Commons) and CH-1C (Abbeyland/Capdoo & Abbeyland/Glebe) comprise lines of trees and rough hedging. The section of CH-1B along the northern extent of Field 2 (F2) is formed by a low ban with trees and rough hedging; the section between Field 1 & 2 (F1 & F2) is largely formed by an open drain/ditch which is very much overgrown (Plates 11.1 & 11.2), while the section between Field 2 and Field 4 (F2 & F4) is formed by a bank which is up to 1.5m in height and 1m in width, with tree/hedge planting along the external edges (Plates 11.3 & 11.4); the section running north-south within Field 4 (F4) is formed by trees and a rough hedge.

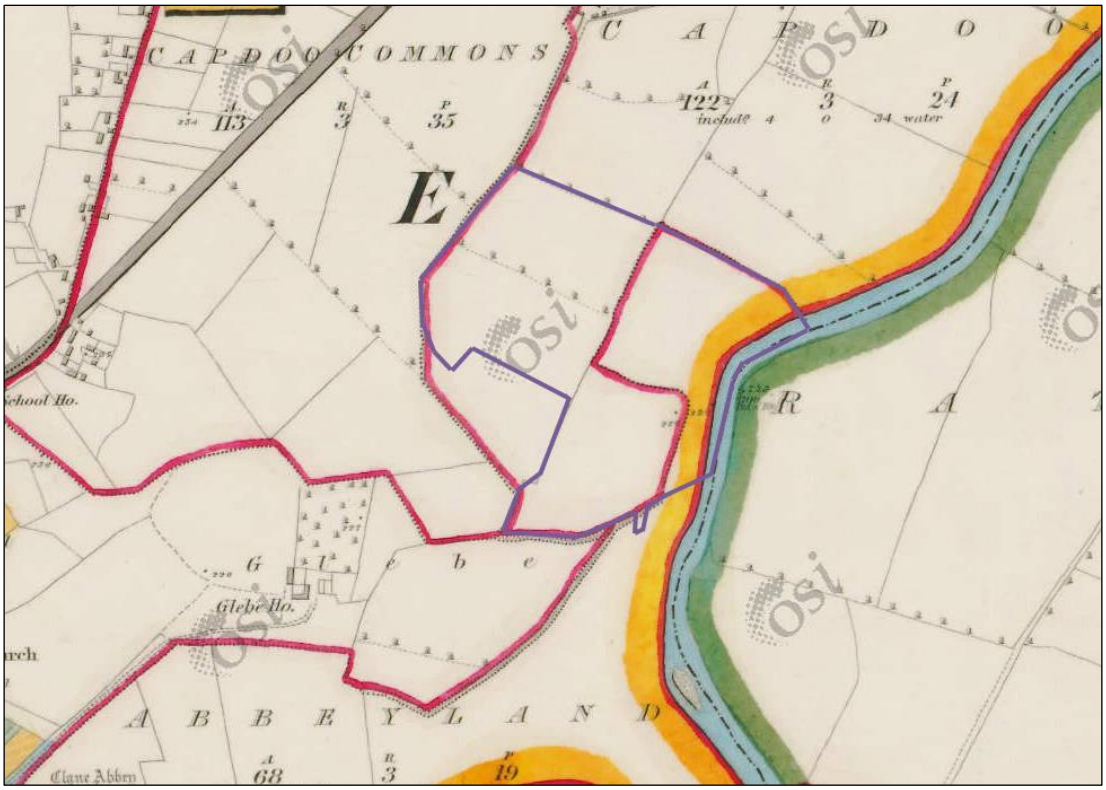

Figure 11.5 Extract from Ordnance Survey Map of 1837.

Plate 11.1 CH-1B (overgrown ditch between F1 & F2).

Plate 11.2 CH-1B (between F1 & F2; from F2).

Plate 11.3 CH-1B (raised bank between F2 & F4).

Plate 11.4 CH-1B (top of bank between F2 & F4).

Griffith's Valuation (*Primary Valuation of Ireland 1848-64*) of 1854 notes that the subject lands forming a portion of Capdoo townland were owned by Margaret Sweetman and leased to John Rourke while those forming a portion of Abbeyland were owned by Sarah and Jane Atkinson and leased by Christopher Byrne.

The Ordnance Survey map of 1939 (Figure 11.6) indicates that the lands were still in agricultural use with no changes to the internal boundaries, although none are indicated with tree planting. A road/trackway is indicated running southwest from the Clane-Celbridge road and terminating at the western boundary of the southernmost field of the subject proposed development lands.

Today, the town of Clane retains a compact linear core along the Main Street, with residential development extending outwards to north, east and west. It has expanded significantly since the 1960s. New residential neighbourhoods have developed predominantly to the northwest, along the Ballynagappagh and Kilcock Roads, and to the southeast between the Celbridge Road and the River Liffey. Retail and commercial uses are focused primarily on Clane's historic Main Street, with some more recent retail and commercial development at the edge of the town centre and on the Celbridge Road (e.g. Westgrove Hotel, Abbeylands Shopping and Medical Centre, Lidl and Tesco Metro). Community and Educational uses, including schools and Clane General Hospital, are clustered on the Prosperous Road, and there is also a cluster of employment uses in the Clane Business Park on the Kilcock Road.

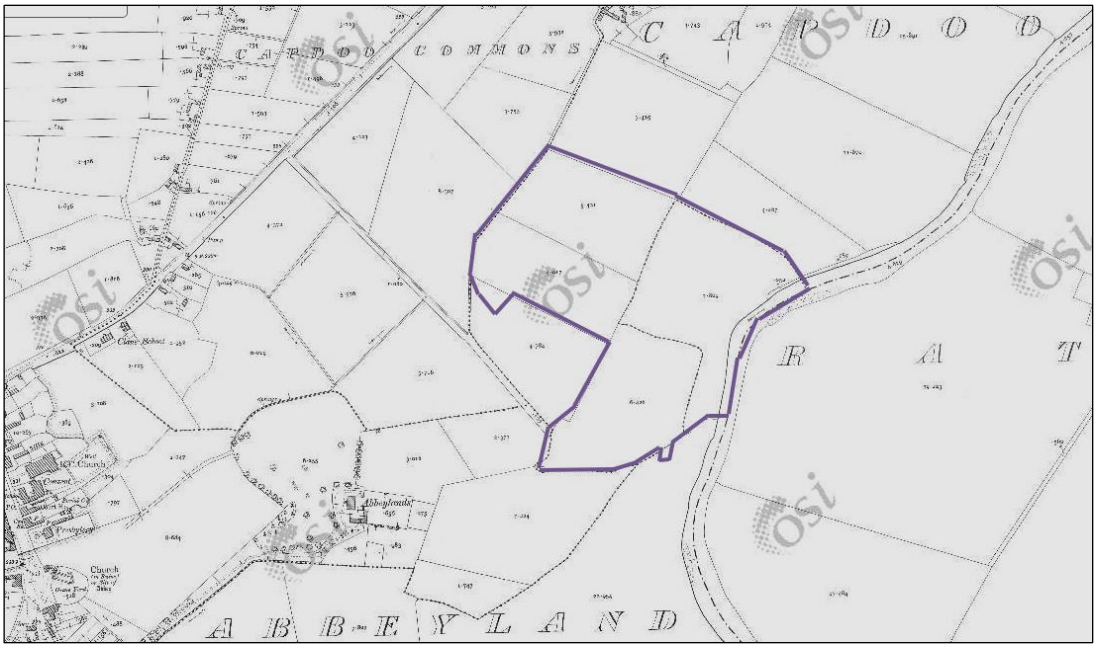

Figure 11.6 Extract from Ordnance Survey Map of 1939.

11.3.2 Archaeological Heritage

Archaeology is the study of past societies through their material remains and the landscapes they lived in. "The archaeological heritage consists of such material remains (whether in the form of sites and monuments or artefacts in the sense of moveable objects) and environmental evidence" (DoAHG 1999, p9).

11.3.2.1 Statutory Protections

The statutory and administrative framework of development control in zone of archaeological potential or in proximity to recorded monuments has two main elements:

(a) Archaeological preservation and licensing under the National Monuments Acts and
(b) Development plans and planning applications under the Planning Acts.

11.3.2.1.1 National Monuments Acts 1930-2004

Section 12 (1) of the National Monuments (Amendment) Act, 1994 provides that the Minister for the Environment, Heritage and Local Government shall establish and maintain a record of monuments and places where the Minister believes there are monuments, such record to be comprised of a list of monuments and relevant places and a map or maps showing each monument and relevant place in respect to each county of the State. This is referred to as the 'Record of Monuments and Places' (RMP), and monuments entered into it are referred to as 'Recorded Monuments'.

Section 12(3) of the National Monuments (Amendment) Act 1994 provides for the protection of monuments and places in the record, stating that "*When the owner or occupier (not being the Minister) of a monument or place which has been recorded under subsection (1) of this section or any person proposes to carry out, or to cause or permit the carrying out of, any work at or in relation to such monument or place, he shall give notice in writing of his proposal to carry out the work to the Minister and shall not, except in the case of urgent necessity and with the consent of the Minister, commence work for a period of two months after having given the notice.*

11.3.2.1.2 Kildare County Development Plan 2017 – 2023

The following relevant Archaeological Heritage Policies and Objectives are set out in Section 12.9.1 of the Plan:

AH1	Manage development in a manner that protects and conserves the archaeological heritage of the county, avoids adverse impacts on sites, monuments, features or objects of significant historical or archaeological interest and secures the preservation in-situ or by record of all sites and features of historical and archaeological interest. The Council will favour preservation in – situ in accordance with the recommendation of the Framework and Principals for the Protection of Archaeological Heritage (1999) or any superseding national policy.
AH2	Have regard to the Record of Monuments and Places (RMP), the Urban Archaeological Survey and archaeological sites identified subsequent to the publication of the RMP 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.
AH3	Secure the preservation (in-situ or by record) of all sites, monuments and features of significant historical or archaeological interest, included in the Record of Monuments and Places and their settings, in accordance with the recommendations of the Framework and Principles for the Protection of Archaeological Heritage, DAHG (1999), or any superseding national policy document
AH4	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 sited and designed in such a way as to avoid impacting on archaeological heritage that is of significant interest including previously unknown sites, features and objects.

11.3.2.2 Archaeological Inventory

Given the historical and archaeological background to the area, as outlined above in Section 11.3.1, a Zone of Archaeological Potential (ZAP; SMR No: KD014-026) has been established for Clane, part of the extent of which is illustrated in Figure 11.8 (shaded pink). This is not located within the defined Cultural Heritage Study Area (11.1.1 above). There are no previously identified monuments/areas of archaeological interest within, or in the immediate environs of, the subject development lands. No features of archaeological potential were noted by cartographic and aerial photographic research and no surface features/traces of archaeological potential were noted by the surface reconnaissance survey.

The nearest recorded monument to the subject lands is 'St. Brigid's' Well (**SITE CH-2**; Figure 11.8). This is marked on the 1930 Ordnance Survey map (Figure 11.6) but not on the earlier edition; the well is described by the Archaeological Survey of Ireland (www.archaeology.ie) as 'overgrown and disused'. Jackson (1979-80, 148) notes that the well was not associated with any pattern or tradition. A second, anonymous, source (JKAS 1899-1902, 269) records that an old man pointed out St Brigid's Well 'close to the spot where the ancient ford crossed the Liffey'. The site of the monument, as indicated by the National Monuments Service (www.archaeology.ie), is at a distance of 310m to the east of the subject proposed development lands (Figure 11.8).

11.3.2.3 Previously Discovered Artefacts

A number of artefacts are listed in the Topographical Registers of the National Museum of Ireland, as having been discovered from Clane, most of which are associated with licenced archaeological investigations.

Those not associated with archaeological investigations are:

- 1971:928-930 – Human Skeleton, Potsherds and Fragment of Lignite Bracelet
- 1971:931 – Human Skeleton
- 1975:255 – Polished Stone Axehead

There are no reported discoveries specific to the townlands of Abbeyland or Capdoo.

11.3.2.4 Results of Previous Relevant Archaeological Investigations

A programme of Archaeological Testing was undertaken within the proposed development extents of the subject lands from 12th – 16th August 2019 under licence (Ref: 19E0500) from the Department of Culture, Heritage and the Gaeltacht. A total of 30 test trenches were mechanically excavated within the development site, the locations of which are illustrated below in Figure 11.7. The positions of the trenches within the lands largely based on the existing topographical nature of the site, together the proposed development layout. All the trenches were excavated by machine fitted with a toothless ditching bucket, following which the resultant spoil was 'raked over' to increase the chances of artefact recovery. The trenches were excavated in spits of approx. 10cm depth, with the surface of each spit examined before excavation of the next and terminated at the surface of the underlying subsoil. No subsurface features of archaeological interest or potential were uncovered and no artefacts of archaeological or historical interest were recovered. A detailed description of the testing is included in Appendix 11.1.

Figure 11.7 Locations of Archaeological Test Trenches within extent of subject site.

A search undertaken of the annual Archaeological Excavations Bulletin (www.excavations.ie) indicates that a number of archaeological investigations have been undertaken in Clane, none of which were carried out within the subject site. These undertaken in the immediate environs of the subject site and within the defined Cultural Heritage Study area are as follows:

Abbeyland Td: A programme of Archaeological Monitoring of topsoil stripping was undertaken by Colum Hardy and Matthew Seaver, for Valerie J. Keeley Ltd – Licence No: 03E1219 – with respect to the development of a residential estate to the immediate south of the south-eastern extent of the subject site; One rim-sherd of blackware was recorded from the topsoil. Two modern field drains/shores were located within the area stripped. One large piece of worked stone, measuring 0.39m by 0.29m by 0.16m, was recovered from the north–south drain. It was possibly a mullion from the Franciscan friary located c. 100m to the west. Two pieces of medieval pottery were recorded from plough furrows. No other features of archaeological significance were recorded. Isolated patches of recent burning and irregular burnt-root systems were evident.

Capdoo Commons: Archaeological investigations, including limited geophysical survey and pre-development testing were undertaken by Archer Heritage Planning Ltd of a site located in Capdoo Commons, positioned approx. 530m to the northwest of the subject site; No subsurface remains of interest were uncovered.

Capdoo Commons: Archaeological monitoring of topsoil striping associated with a residential development incorporating KD014-020 (well) was undertaken by Carmel Duffy – Licence No: 05E0117; nothing of interest was uncovered.

11.3.3 Architectural Heritage

Architectural heritage has several definitions and meanings for people. A useful rule of thumb (which is actually the legal situation) is set out in the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999 which provides the following definition:

- (a) structures and buildings together with their settings and attendant grounds, fixtures and fittings,
- (b) groups of such structures and buildings, and
- (c) sites, which are of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest.

11.3.3.1 Kildare County Development Plan 2017 – 2023

Section 51 of the Planning and Development Act, 2000 (as amended) requires the Development Plan to include a record of structures. These structures form part of the architectural heritage of the County and are to be protected. The Council has drawn up this list, referred to as the Record of Protected Structures (RPS).

The RPS is a section of the Development Plan in which each structure is given a reference number.

There are no structures listed in the RPS of the Development Plan as being located within the subject site. There is one structure listed in the RPS as being located within the defined Cultural Heritage Study Area – **SITE CH-3**; Figure 11.8.

This is Abbeyland House (RPS Ref: B14-42), located 255m to the east of the southernmost extent of the subject proposed development lands.

11.3.3.2 National Inventory of Architectural Heritage (NIAH)

The National Inventory of Architectural Heritage (NIAH) is a state initiative under the administration of the Department of Culture, Heritage and the Gaeltacht. It was established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999. Its purpose is to identify, record, and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently as an aid in the protection and conservation of the built heritage. It is intended that the NIAH will provide the basis for the recommendations of the Minister for Culture, Heritage and the Gaeltacht to the planning authorities.

There are no structures identified by the NIAH as being located within the subject development lands. The only NIAH structure within the defined Cultural Heritage Area is Abbeyland House (NIAH Ref: 11808010), which is also a Protected Structure (RPS No; B14-42), as noted above; the location of the structure (**SITE CH-3**) is illustrated in Figure 11.8.

It is described by the NIAH as a 'detached five-bay two-storey over part-raised basement house, c.1775, retaining some original fenestration with round-headed door opening to centre approached by flight of steps and three-storey rear elevation to south-east having round-headed opening to centre first floor; now disused with openings blocked-up. It includes a hipped roof with slate and clay ridge tile, with rendered chimney stacks and profiled cast-iron rainwater goods; painted roughcast walls with rendered stringcourse to ground floor.

It incorporates square-headed window openings and stone sills; now boarded-up with some retaining original 6/6 timber sash windows (glazing missing); round-headed door opening approached by flight of steps with fluted Doric doorcase with frieze and moulded entablature, now boarded-up, and a bat-wing fanlight. Interior with timber panelled shutters to window openings. Set back from road in own grounds. Tarmacadam forecourt to front. There is a freestanding gas lamp standard, c.1880, to north comprising moulded base with shaft having gas lamp fitting over with moulded finial'.

The NIAH appraisal of the structure states that 'Abbeylands (House), although now disused and in poor repair, remains a fine and imposing substantial house of the late eighteenth-century. Typical of many substantial houses of the period the house is composed on a symmetrical plan and with elevations of graceful proportions, the front elevation being centred about a fine round-headed door opening with decorative fanlight.

The house is of social and historic interest, being one of the largest private residences in the vicinity of Clane, and it is possible that the building was once a source of employment in the locality. Despite its current state the house retains some of its original or early features and fittings, including the decorative doorcase, the remains of multi-pane timber sash fenestration to the rear (south-east) elevation, timber panelled internal shutters to the window openings and a slate roof. The house is attractively set in its own grounds, although these too are in poor repair and are apparently being developed as a modern housing estate. To north a rare survival is the early gas lamp holder, which is of some artistic and technical interest'.

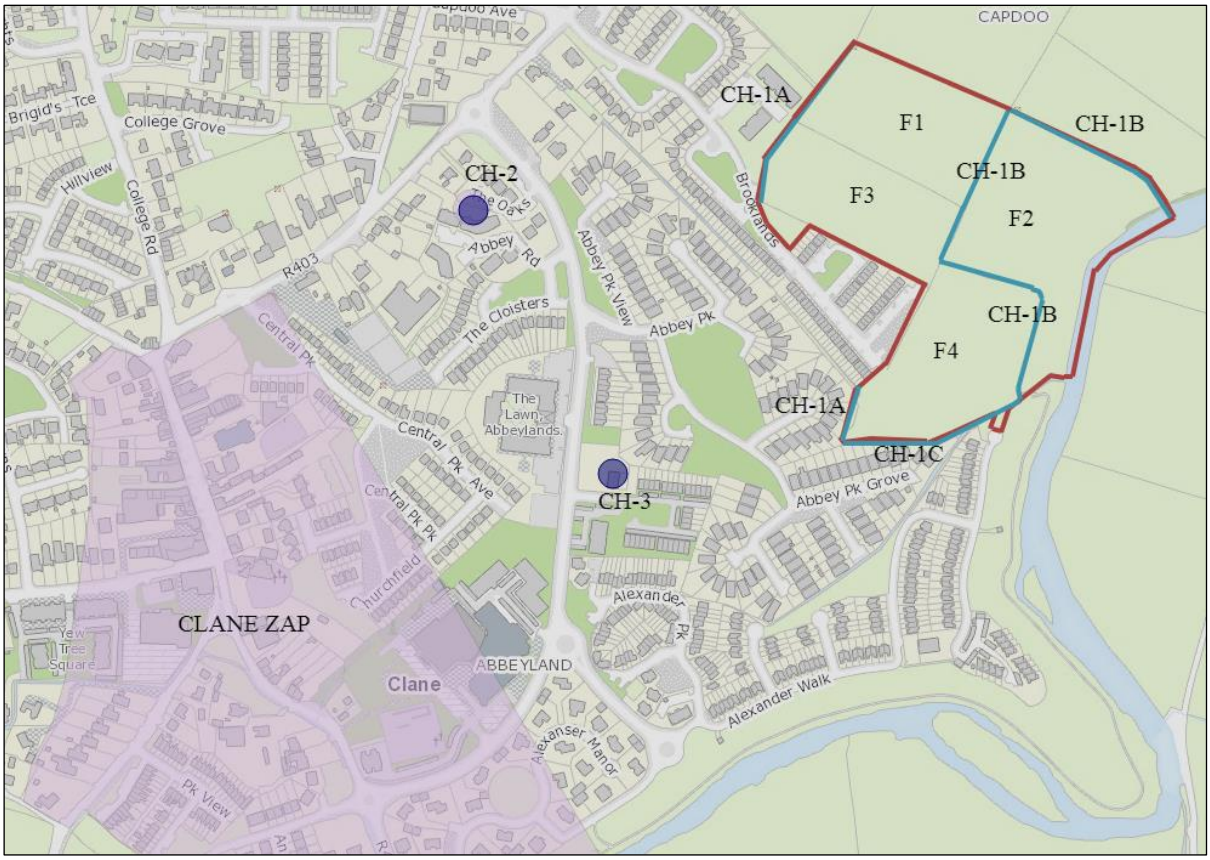

Figure 11.8 Locations of cultural heritage features within defined study are (subject site outlined in red; townland boundaries in blue); Clane ZAP highlighted in pink.

11.4 Characteristics of the Proposed Development

The project consists of an application for a Strategic Housing Development by Westar Investments Limited (the applicant) for a new residential development on lands measuring approximately 10.32 hectares at Abbeyland and Capdoo, Celbridge Road, Clane, Co. Kildare.

The application is for a development that includes 305 dwellings consisting of:

- 01 no. 1 bedroom Apartments (Block C)
- 12 no. 1 bedroom own door Maisonette (Types J, K, L & M)
- 103 no. 2 bedroom Apartments (Block C, D, F & L)
- 8 no. 2 bedroom Maisonette (Types N, ND, O & OD)
- 34 no. 2 bedroom own door Apartments (Type G)
- 01 no. 3 bedroom Apartments (Block C)
- 34 no. 3 bedroom own door Duplex Apartments (Type H)
- 20 no. 2 bedroom mid terrace houses (Types F)
- 34 no. 3 bedroom semi-detached houses (Types B, BD, D & DD)
- 14 no. 3 bedroom end of terrace houses (Types E & ED)
- 44 no. 4 bedroom semi-detached houses (Types A & AD)

The development also includes a single-storey creche facility (Part of the ground floor of Apartment Block D); associated car parking; surface water attenuation, site entrances, landscaping and all associated site development works. A layout plan of the development, as proposed, is illustrated in Figure 11.9 overleaf.

Figure 11.9 Proposed layout plan

11.5 Potential Impact of the Proposed Development

11.5.1 Construction Phase

11.5.1.1 Local History

The general historical background to the subject development area was introduced above in Section 11.3.1. In summary, there are no significant historical events associated with the proposed development lands which have the ability to be impacted upon by the proposed development. A number of the existing field boundaries within, and along the extent of, the subject proposed development lands act as townland boundaries, as illustrated in Figures 11.5, 11.6 and 11.8. The trees and hedging to Boundaries CH-1A and CH-1C will be retained, as will much of Boundary CH-1B within Field 4 (F4) except for a short section at its southernmost extent. Boundary CH-1B between Fields 1 and 2 (F1 & F2) will be removed in its entirety, although the greater length will be reinstated with new planting, while short sections of this boundary between Fields 2 and 4 (F1 & F4) will be permanently removed to accommodate access roads and footpaths, with the majority of the boundary retained.

11.5.1.2 Archaeological Heritage

There are no previously identified monuments or features of archaeological interest located within, or in the immediate environs of, the subject proposed development lands, as noted above in Section 11.3.2.2, and no surface features of potential were noted by cartographic and aerial photographic interest or by a comprehensive surface reconnaissance survey of the subject lands and immediate environs. The nearest monument is St. Brigid's Well (Site CH-2), located at a distance of 310m to the east of the

subject proposed development lands. In addition, there are no artefacts recorded by the National Museum of Ireland as having been discovered from the lands or immediate environs. A programme of Archaeological Testing was undertaken within the extent of the subject proposed development lands, as summarised above in Section 11.3.2.5 and described in Appendix 11.1. A total of 30 trenches, of varying lengths and orientations, were excavated and no subsurface features of archaeological interest/potential were uncovered and no artefacts of interest were recovered.

Given the above, it is considered that the subject proposed development lands are of very low/negligible archaeological potential and it is not considered likely that the proposed development will cause any impacts with respect to any features of archaeological heritage interest during the construction phase of the project.

11.5.1.3 Architectural Heritage

As noted above in Sections 11.3.3.1 and 11.3.3.2, there are no structures of architectural interest located within, or in the immediate environs of, the subject proposed development lands. The nearest Protected Structure is Abbeyland House (Site CH-3) located 255m to the east of the southernmost extent of the subject proposed development lands; this is also the nearest NIAH listed structure. Consequently, it is not envisaged that the development, as proposed, will cause any direct impacts to structures of architectural heritage interest during the construction phase of the project.

11.5.2 Operational Phase

11.5.2.1 Local History

The only features of historical interest within the extent of the subject development lands are townland boundaries and will be largely retained or replanted, except for short sections to be removed for vehicular/pedestrian access. The nature of these features is not visually identifiable, as they act as field boundaries and have no intrinsic elements which mark them out as townland boundaries. It is considered that, the retention of the greater lengths of these boundaries is a positive benefit as they will be largely retained as part of the overall proposed development. A mitigation strategy is proposed below to further enhance the visual identity of the townland boundaries in Sections 11.6.1 and 11.6.2 below.

11.5.2.2 Archaeological Heritage

There are no extant monuments or features of archaeological interest and/or potential located within, or in the immediate environs of, the subject proposed development lands. The nearest monument is St. Brigid's Well (Site CH-2), located at a distance of 310m to the east of the subject proposed development lands; this is a low-visibility feature which cannot be viewed from the subject lands due to its existing nature and the locations of existing residential units in the intervening areas. Consequently, it is considered that the development, upon completion, will not cause any visual impacts from the perspective of archaeological heritage.

11.5.2.3 Architectural Heritage

As noted above in Sections 11.3.3.1 and 11.3.3.2, there are no structures of architectural interest located within, or in the immediate environs of, the subject proposed development lands. The nearest Protected Structure is Abbeyland House (Site CH-3) located 255m to the east of the southernmost extent of the subject proposed development lands; this is also the nearest NIAH listed structure. It cannot be viewed from the subject development lands due to constructed residences in the intervening areas between it and such lands. Consequently, it is not envisaged that the development, upon completion, will cause any direct impacts to structures of architectural heritage interest during the construction phase of the project.

11.6 Mitigation and Remedial Measures

11.6.1 Construction Phase

As noted above in Section 11.5.1.1, the only features of historical interest within the extent of the proposed development lands are lengths of townland boundaries (CH-1). These will largely be retained or replanted except for short sections which will require permanent removal for vehicular and pedestrian access. It is considered that the removal of these short sections is acceptable, given that the greater lengths of these boundaries will be retained.

In terms of archaeological and archaeological heritage, there are no monuments or structures of interest located within, or in the immediate environs of, the proposed development lands, as discussed above in Sections 11.5.1.2 and 11.5.1.3. In addition, a programme of Archaeological Testing was undertaken within the extent of the subject proposed development lands, as summarised above in Section 11.3.2.5 and described in Appendix 11.1. A total of 30 trenches, of varying lengths and orientations, were excavated and no subsurface features of archaeological interest/potential were uncovered and no artefacts of interest were recovered. Consequently, as further noted above in Section 11.5.1.2, it is considered that the subject proposed development lands are of very low/negligible archaeological potential and it is not considered likely that the proposed development will cause any impacts with respect to any features of archaeological heritage interest during the construction phase of the project.

Given the above, it is considered, from the overall perspective of Cultural Heritage, that no mitigation measures are required during the construction phase of the proposed development

11.6.2 Operational Phase

In terms of archaeological and archaeological heritage, there are no monuments or structures of interest located within, or in the immediate environs of, the proposed development lands. As noted above in Section 11.5.2.2, the nearest archaeological monument is St. Brigid's Well (Site CH-2), located at a distance of 310m to the east of the subject proposed development lands, while, as noted in Section 11.5.2.3, the nearest Protected / NIAH-listed Structure is Abbeyland House (Site CH-3) located 255m to the east of the southernmost extent. These cannot be viewed from the subject lands due to the locations of existing residential units in the intervening areas. Consequently, it is considered, from the perspective of Archaeological and Architectural Heritage, that no mitigation measures are required following the completion of the proposed development.

In terms of Local History, the only features of interest within the extent of the subject development lands are townland boundaries and these will be largely retained or replanted, except for short sections to be removed for vehicular/pedestrian access. As noted above in Section 11.5.2.1, the nature of these features is not visually identifiable, as they act as field boundaries and have no intrinsic elements which mark them out as townland boundaries. It is suggested that, in order to enhance the appreciation of these townland boundary features, that the following measures be implemented following construction of the proposed development:

- Markers should be established at those locations where the townland boundaries are truncated by the proposed vehicular and pedestrian routes. The markers should include the names of the townlands and be erected on stone markers or plaques inserted into the footpaths.

11.7 Predicted Impact of the Proposed Development

In terms of the overall Cultural Heritage perspective, it is considered that there are no predicted negative impacts arising from the construction or subsequent operation of the development of the proposed development. It is considered that the implementation of the mitigation proposal with respect to the townland boundaries (Section 11.6.2) will enhance knowledge and appreciation of such boundaries, and it is predicted that such measure will be of positive benefit in terms of the local history of the area.

11.8 Monitoring

It is not considered that any monitoring measures are required at either constriction of post-construction phases of the proposed development.

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12.0 LANDSCAPE AND VISUAL AMENITY

12.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) addresses the potential landscape and visual effects of the proposed residential development located on lands at Capdoo and Abbeyland, Clane, Co. Kildare. The emphasis in this chapter is on the likely significant effects of the proposal. It outlines the methodology for the assessment, a description of the proposed project, the existing landscape as well as landscape policy and relevant guidance.

This chapter has been prepared by Ms. Gwen Tierney; Landmark Designs Ltd. Ms. Tierney's relevant qualification is B.Ag.Sc. Land. Hort. Ms. Tierney has over 20 years' experience in the landscape design and master planning and implementation of a variety of projects including national road schemes, industrial and business parks, public parks, residential and commercial schemes.

12.1.1 Proposed Development

This project consists of an application for a Strategic Housing Development by Westar Investments Limited (the applicant) for a new residential development on lands measuring approximately 10.32 hectares at Capdoo and Abbeyland, Celbridge Road, Clane, Co. Kildare. The application is for a development that includes 305 dwellings consisting of:

- 01 no. 1 bedroom Apartments (Block C)
- 12 no. 1 bedroom own door Maisonette (Types J, K, L & M)
- 103 no. 2 bedroom Apartments (Block C, D, F & L)
- 8 no. 2 bedroom Maisonette (Types N, ND, O & OD)
- 34 no. 2 bedroom own door Apartments (Type G)
- 01 no. 3 bedroom Apartments (Block C)
- 34 no. 3 bedroom own door Duplex Apartments (Type H)
- 20 no. 2 bedroom mid terrace houses (Types F)
- 34 no. 3 bedroom semi-detached houses (Types B, BD, D & DD)
- 14 no. 3 bedroom end of terrace houses (Types E & ED)
- 44 no. 4 bedroom semi-detached houses (Types A & AD)

The development also includes a single-storey creche facility (Part of the ground floor of Apartment Block D); associated car parking; surface water attenuation, site entrances, landscaping and all associated site development works.

12.1.2 Purpose of Report

This report covers two distinct but related areas:

1. Landscape Impact Assessment (LIA) which relates to the assessment of effects on the landscape as a resource in its own right and is concerned with how the proposal will affect the physical elements that make up the landscape and its distinctive character.

2. Visual Impact Assessment (VIA) while relates to the assessment of effects on specific views and on the general visual amenity experienced by people. This deals with how the surroundings of individuals, or groups of people, may be specifically affected by changes in the content and character of views as a result of the change or loss of existing elements of the landscape and/or introduction of new elements. Visual impacts may occur from Visual Obstruction (blocking of a view) or Visual Intrusion (interruption of a view without blocking).

Photomontages have been produced for the proposed development, and are included in a separate volume prepared by Mr. Chris Shackleton. A Green Infrastructure Strategy and Landscape Design Rationale has also been produced for the proposed development. Measures to mitigate landscape and visual impacts are described and illustrated in the Strategy and detailed in the Landscape Masterplan.

12.2 Methodology

12.2.1 Research Methodology

The visual assessment methods are derived from the following guidance:

- Guidelines for Landscape and Visual Impact Assessment (The Landscape Institute and Institute of Environmental Management and Assessment 2013)
- EPA Advice Notes on Current Practice in the preparation of Environmental Impact Statements (EPA, 2003).
- Guidelines on the Information to be contained in Environmental Impact Statements' (Environmental Protection Agency 2002).
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (Environmental Protection Agency 2002).
- DoEHLG Landscape and Landscape Assessment Guidelines (June 2000).

The assessment was undertaken through analysis of up to date OSI Discovery Series maps in conjunction with current design details of the proposed development. A review of statutory planning and other documents in order to ascertain the local and wider significance from a visual perspective. A site visit was undertaken in June 2019 to assess the existing environment and surrounding area and the visual impacts associated with the proposed development. Existing visual resources were established along with sensitive receptors, i.e. residential properties, scenic viewpoints and visitor amenity areas.

The proposed development was then applied to this visual baseline and the potential impacts predicted. The assessment is based on desk study of the study area, field surveys of the site and surrounds and the use of photographs and photomontages from representative viewpoints of the site. The landscape of the area is described in terms of its existing character, which includes a description of the physical and visual character, landscape values and the landscape's sensitivity to change. The potential impacts in both landscape and visual terms are then assessed, including cumulative impact.

12.2.2 Context of the Study Area

The Kildare County Development Plan, 2017-2023 sets out the policies and objectives for the county. Chapter 14 contains specific landscape related zoning, policies and objectives. These include recreation and amenity land use zoning and associated objectives as well as objectives with regard to green infrastructure and landscape character. Other relevant planning policy for the subject site is contained in the Clane Local Area Plan 2017-2023.

12.2.3 County Development Plan Landscape Policies

The site of the proposed development is located in one Landscape Character areas and the most relevant County Development Plan Landscape Planning policies in terms of its Landscape Character designations, Scenic Routes and Protected Views include but are not limited to the following:
General Landscape planning policies of particular importance to this development include:

LA 3: To require a Landscape/Visual Impact Assessment to accompany significant proposals that are likely to significantly affect:

- *Landscape Sensitivity Factors*
- *A Class 4 or 5 Sensitivity Landscape (i.e. within 500m of the boundary)*
- *A route or view identified in maps 14.2 and 14.3 (i.e. within 500m of the boundary)*

Landscape planning policies of particular importance to the River Liffey LCA, Special Water Corridors (Rivers and Canals, Areas of High Amenity) include:

WC 1: To seek to locate new development in the water corridor landscape character areas towards existing structures and mature vegetation.

WC 2: To facilitate appropriate development that can utilise existing structures, settlement areas and infrastructure, whilst taking account of the visual absorption opportunities provided by existing topography and vegetation.

WC 3: To control development that will adversely affect the visual integrity of distinctive linear sections of water corridors and river valleys and open floodplains.

WC 5: To promote the amenity, ecological and educational value of the canals and rivers within the county while at the same time ensuring the conservation of their fauna and flora, and protection of the quantity and quality of the water supply.

WC 8: To contribute towards the protection of waterbodies and watercourses, including rivers, streams, associated undeveloped riparian strips, wetlands and natural floodplains, from inappropriate development. This will include buffers of free development in riverine and wetland areas, as appropriate.

Landscape planning policies of particular importance to Scenic Routes and Protected Views include:

SR 1: To protect views from designated scenic routes by avoiding any development that could disrupt the vistas or disproportionately impact on the landscape character of the area thereby affecting the scenic and amenity value of the views.

12.2.4 Clane Local Area Plan Landscape Policies

In addition to the County Development Plan, the Clane Local Area Plan outlines a number of policies that include but are not limited to the following:

Policy GI1 - Green Infrastructure

It is the policy of the Council to protect, enhance and further develop the Green Infrastructure network in Clane and to strengthen links to the wider regional network.

Objectives

GIO1.1 To reduce fragmentation of the Green Infrastructure network and strengthen ecological links within Clane and to the wider regional network.

GIO1.2 To integrate Green Infrastructure as an essential component of all new developments and restrict development that would fragment or prejudice the Green Infrastructure Network.

GIO1.3 To seek to protect and enhance the biodiversity value and ecological function of the Green Infrastructure network.

GIO1.6 To maintain a biodiversity protection zone of 80 metres from the top bank of the River Liffey and of not less than 10 metres from the top bank of smaller watercourses in Clane, with the full extent of the protection zone to be determined on a case by case basis by the Planning Authority, based on site specific characteristics and sensitivities. Strategic green routes and trails will be open for consideration within the biodiversity protection zone, subject to appropriate safeguards and assessments.

Policy H3 - Protection of Habitats

Objectives

HO3.2 To preserve the amenity of the River Liffey Valley including its landscape and biodiversity value. In this regard, planning applications must identify all ecological habitats and corridors present in a proposed development site, and demonstrate that any habitat or corridor affected by the proposal is not of local importance, or that its loss will be offset, should the application be granted.

12.2.5 Protect Views and Prospects

While there are no protected views or scenic routes identified in the County Development Plan located within the immediate vicinity of the site of the proposed development the closest protected view is RL 5 – Alexandra Bridge, Abbeyland (Table 14.6 CDP 2017-2023) which identifies the view from the Bridge to the Liffey. The site of the proposed development is not visible from Alexandra Bridge.

12.2.6 Appraisal of Landscape and Visual Impacts

12.2.6.1 Landscape Impact Assessment Criteria

When assessing the potential impacts on the landscape resulting from a proposed project, the following criteria are considered:

- Landscape Character Sensitivity
- Magnitude of likely impacts
- Significance of landscape effects.

12.2.6.2 Fieldwork, Viewshed Reference Point Selection and Photo Capture

The site work stage involves the verification of 5 designated views from the initial desk-based study, analysis of same by annotated photographs.
Photomontages for the proposed development have been generated separately by Mr. Chris Shackleton, these are included within a separate volume. The photomontages accurately represent the way in which the future development will be perceived within its immediate surroundings.

12.2.6.3 Sensitivity of the Landscape

The sensitivity of the landscape to change is the degree to which a particular Landscape Character Area (LCA) can accommodate change or new elements without unacceptable detrimental effects to its essential characteristics. Landscape Sensitivity is often referred to as 'value' and is classified using the following criteria:

Sensitivity Level	Typical Criteria
High Sensitivity	Landscapes where the landscape character is highly susceptible to change and the landscape receptor has a low ability to accommodate change. e.g. users of an outdoor recreation feature which focuses on the landscape; valued views enjoyed by the community; tourist visitors to scenic viewpoint; occupiers of residential properties with a high level of visual amenity.
Medium Sensitivity	Landscapes where the overall landscape character has a moderate ability to accommodate the proposed development. e.g. users of an outdoor sport or recreation which does not offer or focus attention on landscape; occupiers of residential properties with a medium level of visual amenity.
Low Sensitivity	Landscapes where the overall landscape character has a strong ability to accommodate the proposed development e.g. regular commuters, people at place of work, likely to be travelling for other purposes than just the view; occupiers of residential properties with a low level of visual amenity.

Table 12.1 Sensitivity of landscape.

12.2.6.4 Magnitude of Likely Landscape Impacts

The magnitude of a predicted landscape impact is a product of scale, extent or degree of change that is likely to be experienced as a result of the proposed project. The magnitude takes into account whether there is a direct physical impact resulting from the loss of landscape components and/or a change that extends beyond the boundary of the proposed project that may have an effect on the landscape character of the area.

Category	Criteria
High	Total loss or alteration to key elements/features/characteristics of the existing view and/or introduction of elements considered totally uncharacteristic when set within the attributes of the receiving landscape or view.
Medium	Partial loss or alteration to the key elements/features/characteristics of the existing view and/or introduction of elements that may be prominent but not necessarily substantially uncharacteristic when set within the attributes of the receiving view.
Low	Minor loss or alteration to the key elements/features/characteristics of the existing view and/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving view.
Negligible	Very minor loss or alteration to the key elements/features/characteristics of the existing view and/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving view.

Table 12.2 Magnitude of landscape

12.2.6.5 Significance of Likely Landscape and Visual Impacts

The significance of the landscape impact will be the combination of the sensitivity of the landscape against the magnitude of change.

Magnitude of Visual Resource Change	Sensitivity		
	High	Medium	Low
High	Major	Moderate/Major	Moderate
Medium	Moderate/Major	Moderate	Moderate
Low	Moderate	Minor	Negligible
Negligible	Minor	Negligible	Negligible

Table 12.3 Significance of landscape and visual effects.

Degree of Significance	Description of Landscape Impact	Description of Visual Impact
Major	Substantial alterations to elements / features of the existing conditions. Notably affect an area of recognised national landscape quality. Substantial alteration to the character, scale or pattern of the landscape.	Major / Substantial alterations to elements / features of the existing conditions. Where the proposed development would cause a very noticeable alteration in the existing view. This would typically occur where the proposed development closes an existing view of a landscape of regional or national importance and the proposed development would be dominate the future view.
Moderate	Alteration to elements / features of the existing conditions. Affects an area recognised regional landscape quality. Alteration to the character, scale or pattern of the landscape.	Alteration to one or more elements / features of the existing conditions such that post development character of the baseline will be materially changed. This would typically occur where the proposed development closes an existing view of a local landscape and the proposed development would be prominent in the future view.
Minor	A minor shift away from baseline conditions. The development partially changes the character of the site without compromising the overall existing landscape character area.	A minor shift away from baseline conditions. This occurs where change arising from the alteration would be discernible but the underlying character of the baseline condition will be similar to the pre-development. It would also occur where the proposed development newly appears in the view but

		not as a point of principal focus or where the proposed development is closely located to the viewpoint but seen at an acute angle and at the extremity of the overall view.
Negligible	No or very little change from the baseline conditions. Change not material, barely distinguishable or in distinguishable.	Where there is no discernible improvement or deterioration in the existing view.
No Impact	The development would not affect the landscape receptor.	The development would not affect the view.

Table 12.4 Degree of significance of landscape and visual effects.

12.2.7 Visual Impact Assessment Criteria

12.2.7.1 Visual Receptor Sensitivity and Magnitude

The visual assessment measures the extent to which the proposed development can be seen from residences, work places, open space and designated viewpoints. Visual receptors are those people who can see the proposed development prior to mitigation.

Visual impact is described in terms of Visual Obstruction where the receptor's views are physically blocked by the proposals. Visual Intrusion is where the receptors views are affected by the proposed development and loss of vegetative screens due to construction.

The visual impact of the proposed development will be assessed as a function of sensitivity versus magnitude as shown on Table 1.6 i.e. the sensitivity of the visual receptor weighed against the magnitude of the visual effect.

12.2.7.2 Sensitivity of Visual Receptors

Viewer sensitivity is a combination of the sensitivity of the human receptor (i.e. resident, tourist, walker or worker) and the quality of the view experienced by the viewer.

Category	Typical Criteria
High Sensitivity	e.g. Users of an outdoor recreation feature which focuses on the landscape; valued views enjoyed by the community; tourist visitors to scenic viewpoint; occupiers of residential properties with a high level of visual amenity.
Medium Sensitivity	e.g. users of an outdoor sport or recreation which does not offer or focus attention on landscape; occupiers of residential properties with a medium level of visual amenity.
Low Sensitivity	e.g. regular commuters, people at place of work; occupiers of residential properties with a low level of visual amenity.

Table 12.5 Sensitivity of visual receptor.

12.2.7.3 Magnitude of Visual Impact

The magnitude of a visual effect is determined on the basis of several factors; the relative number of viewers, distance from the viewpoint, the visual dominance of the proposed development within a view and its effect on the visual amenity as the following table indicates.

Category	Criteria
High	Total loss or alteration to key elements/features/characteristics of the existing view and/or introduction of elements considered totally uncharacteristic when set within the attributes of the receiving landscape or view.
Medium	Partial loss or alteration to the key elements/features/characteristics of the existing view and/or introduction of elements that may be prominent but not necessarily substantially uncharacteristic when set within the attributes of the receiving view.

Low	Minor loss or alteration to the key elements/features/characteristics of the existing view and/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving view.
No change	Very minor loss or alteration to the key elements/features/characteristics of the existing view and/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving view.

Table 12.6 Magnitude of visual impact.

Magnitude can also be described as:

- Neutral - Changes that are not discernible within the available vista and have no bearing on the visual amenity of the scene.
- Positive – Changes that enhance the available vista by reducing visual clutter or restoring degraded features.

12.2.7.4 Visual Impact Significance

The Significance of the visual impact can only be defined on a project by project basis responding to the type of development proposed and its location. The principal criteria for determining significance are magnitude of visual resource change and viewer sensitivity. Table 12.7 below illustrates the significance of visual impact as a correlation between user sensitivity and magnitude of visual resource change.

Magnitude of Visual Resource Change	**Visual Sensitivity**		
	Low	Medium	High
No Change	No Change	No Change	No Change
Low	Slight	Slight/Moderate	Moderate
Medium	Slight/Moderate	Moderate	Moderate/Substantial
High	Moderate	Moderate/Substantial	Substantial

Table 12.7 Significance of visual impact.

12.3 Existing Environment

The site of the proposed development is located to the north eastern edge of Clane village in the townlands of Capdoo and Abbeyland. The site occupies an area of 10.32 ha, is bounded to the east by the River Liffey, to the south by existing residential developments, namely Alexandra Walk, Abbey Park Orchard and Brooklands. Brooklands also extends to part of the south western boundary of the site, while the remaining northern boundaries are bounded by agricultural lands. The site comprises four fields, one of which comprises a linear section running parallel to the Liffey, all originally in pasture but now currently unused. A pedestrian track exists in that portion of the field running parallel along the Liffey which is used by walkers and enters the site from the existing public open space at Alexandra Walk on the southern boundary.

12.3.1 Physical Landscape

12.3.1.1 Topography

The general topography of the site is generally flat. The highest point is located east of the centre of site at +67.00 O.D. It falls gently and gradually to the south to +66.00 O.D, to the west to +65.00 O.D and to the north to +66.00 O.D. The site falls at a gradient of 1:25 to the east towards the River Liffey banks, which forms the eastern boundary to the proposed development. Ditch and embankment features occur in association with field boundary hedgerows.

12.3.1.2 Land Cover

Vegetation is confined substantially to the boundaries of the existing fields and along the River Liffey. Much of the hedgerows have lapsed into overgrown features comprising original thorn-based species such as hawthorn and blackthorn but in some case are also dominated by Ash and Wych Elm

populations. Due to lack of management over a long period of time, much of the vegetation has extended into the fields creating a massive thicket dominated by bramble and blackthorn. East of the site and adjoining the River Liffey boundary, substantial dense areas of natural regeneration of Common Alder and Goat Willow occur. Aside from a very narrow earth track extending through this growth along the Liffey edge it would require population thinning if to be retained.

12.3.1.3 Land Use

The site can be described as having a broadly lapsed agricultural use. Some areas located to the south east of the site exhibit evidence of site disturbance, appearing to be construction related, possibly from previous site compound works. Natural regenerative Willow scrub once located in the north eastern field has been cleared, the ground here showing signs of disturbance from machinery associated with these works and mulch arising from the harvesting remains on site. Part of the scrub which still exists extends towards the Liffey is to be retained.

12.3.2 Designated Sites and Features

The Clane LAP describes designated sites and features which should be considered in the development of lands within its boundary. With regard to the proposed development, Green Infrastructure Map, Map Ref. 11.1 of the LAP shows landscape features including Hedgerows of Moderate Value, Key Green Infrastructure Areas, Rivers and Scrub.

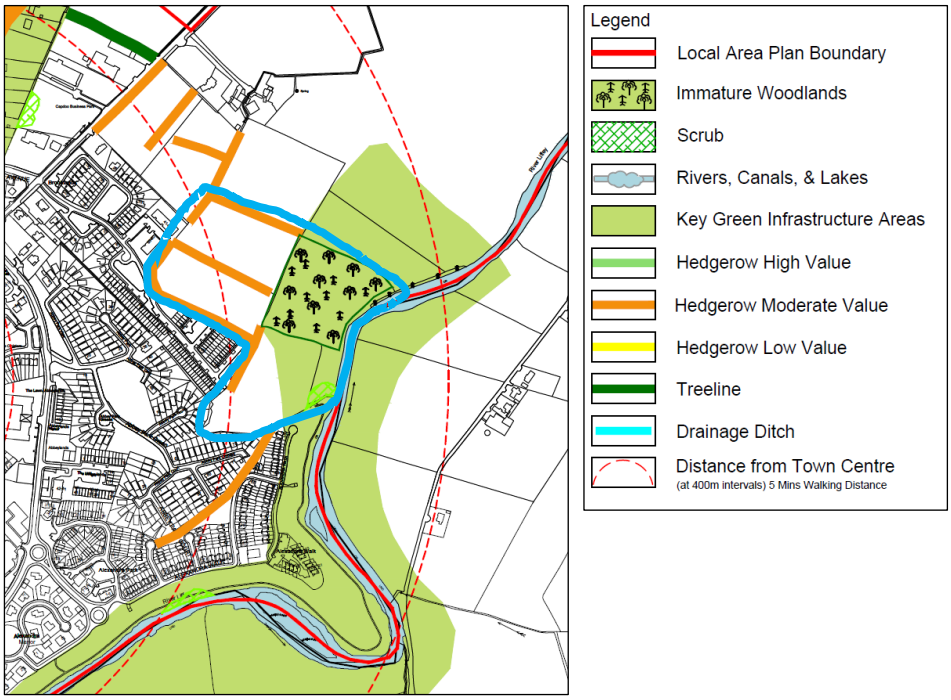

Figure 12.1 Extract from Clane LAP, Green Infrastructure Map; site of proposed development outlined in blue.

12.4 Predicted Impact

12.4.1 Do Nothing Impact

In this instance the landscape character and visual amenity of the area would be unchanged, visual impacts would be as for the current un-used agricultural lands. The do-nothing scenario would mean that the Local Area Plan land use zoning objectives, i.e. New residential / infill and Strategic Open Space will not be realised.

12.4.2 Likely Impacts

Elements of the proposed development which are likely to cause a landscape or a visual impact (positive and negative) during construction and operational period are listed below.

12.4.3 Construction Period

- Disruption to undeveloped agricultural land.
- As detailed on the Arboricultural Impact Assess, the following hedgerows or sections thereof are to be removed –Removal of Hedgerow No. 4, 5, 6 and 9, Partial loss of Hedgerow No. 8, 10, 12, and 15.
- Construction traffic on R403 road and R407 roads.
- Construction traffic including cranes for erection of the proposed development.

12.4.4 Operational Period

The proposed buildings of 305 units, comprising Apartment blocks, up to 13.27m in height, Duplex apartments up to 11.81m in height, Two storey houses up to 9.35m in height and Creche facility up to 3.21m in height.

12.4.5 Landscape Character Impacts

The landscape character is considered on a broad scale and on a local scale. Broad and Local study areas are described and assessed in terms of sensitivity, magnitude and significance of landscape impacts. The County Development Plan 2017-2023 identifies a number of Landscape Character Areas. Each character area is characterised by its distinctiveness and on its sensitivity to development.

12.4.5.1 The Broad Scale

The site of the proposed development is located within the 'River Valley' Character Area, a linear corridor that follows the River Liffey corridor. This area has a landscape sensitivity that is described 'Special' in the CDP with low capacity to accommodate uses without significant adverse effects on the appearance or character of the landscape. In terms of the sensitivity factors described within the Landscape Character Assessment there is one Scenic Viewpoint, RL 5 – Alexandra Bridge, Abbeyland (Table 14.6 CDP 2017-2023) which identifies the view from the Bridge to the Liffey. Table 14.3 of the CDP identifies the likely compatibility between a range of land uses and proximity of less than 300m to the principal landscape sensitivity factor, in this case the River Liffey. In this case the land use 'Urban Expansion' receives a compatibility rating of 2, i.e. Compatible only in certain circumstances.

12.4.5.2 The Local Scale

The character and sensitivities identified above for the River Liffey within Clane Local Area Plan (LAP) has informed the Green Infrastructure and Open Space in that plan. Clane LAP identifies a number of Key Development Areas (KDA) and design briefs in order to promote the development of a number of key areas within the town. The design briefs set out the broad parameters for future development.The site of the proposed development is located within KDA 1, extending between the Celbridge Road and the River Liffey. As identified on the Land Use Zoning Objectives Map, 13.1, a biodiversity protection zone of Strategic Open Space extends along the River Liffey where it is envisaged that walkways and cycleways will be accommodated and would therefore be protected from development. The remainder of the site is zoned New Residential / Infill.

That report has described the Study Area as within the 'River Valley' Character Area and with a Sensitivity rating of Class 4, i.e. High Sensitivity. The magnitude of the development within the Study area is Medium, i.e. there will be partial loss or alteration to the key elements/features/characteristics of the existing landscape and the introduction of elements which may be prominent but not necessarily substantially uncharacteristic when set within the attributes of the receiving view.Overall the impact on the landscape is Moderate/Major in accordance with Table 1.2 Significance of Landscape and Visual effects, i.e. there will be alteration to elements / features of the existing conditions, it does affect an area recognised regional landscape quality and there will be alterations to the character, scale or pattern of the landscape.

12.4.6 Visual Impact Assessment

12.4.6.1 Viewpoint Selection

The potential visibility of the proposed development was established by determining the following:

- The extent of area in which the Proposed Development may be visible.
- The different groups of people (visual receptors) who may experience views of the proposed development.
- The viewpoints where visual receptors will be affected and the nature of the views at those points.

The actual visibility of the proposed development is significantly reduced due to the flat nature of the land within and surrounding the application site, the high degree of enclosure provided by mature boundary tree lined hedgerows and existing residential developments. During the site visit the Visibility Envelope was determined as the area within which the proposed development will be visible without mitigation. The extent of the Visual Envelope is limited to approx. 900m.

A total of 5 viewpoints are selected which are representative views experienced from various receptors within the immediate vicinity looking towards the proposed development. The locations of these viewpoints are mapped on Figure 12.2. The selected views are from publicly accessible areas. The views have been recorded and annotated to show the extent of the proposed development within the photo-view and whether it is visible or not.

Figure 12.2 Site location, viewpoint locations and viewpoint number.

12.4.6.2 Visual Impacts

This section considers the potential effect of the proposed development during construction and operation stages upon the existing views and visual amenity on the visual receptors at the selected viewpoints. Consideration will be given to any differences in the predicted views as a result of establishment growth of proposed mitigation planting from Year 0 – Year 5-10.

12.4.6.3 Visual Assessment

Figure 12.3 Viewpoint No. 1.

Description of existing view

The view is taken heading south west towards Clane on the R403 (Clane-Celbridge Road). Mature roadside hedgerow vegetation confines views to the road itself. There are some gaps in the hedgerow where field access gates occur.

Approximate distance to site boundary

480m

Effects of the proposed development on the existing view

The intervening field and boundary vegetation screen views to the site of the proposed development which is located beyond the field trees and hedgerows.

Sensitivity of receptor

Low Sensitivity

Magnitude of change

The development will be screen by the roadside vegetation and the intervening distance and vegetation. The magnitude of change is considered No Change.

Significance of effects

No Change

Figure 12.4 Viewpoint No. 2.

Description of existing view

This view is from The Lidl Store located southwest of the R403 as its access road joins the R403. The roadside vegetation, distance from the development and intervening residential development restrict views to the site of the proposed development.

Approximate distance to site boundary

250m

Effects of the proposed development on the existing view

The existing view will remain unchanged.

Sensitivity of receptor

Low

Magnitude of change

No Change

Significance of effects

No Change

Figure 12.5 Viewpoint No. 3.

Description of existing view

View from the R407 (Clane-Sallins/Naas Road) looking north east towards the site of the proposed development. The low hedge and open structure of the fence allows views across the adjoining field. The field boundaries in the background restrict views to the proposed development.

Approximate distance to site boundary

900m

Effects of the proposed development on the existing view

The distance from the site of the proposed development together with the intervening fields and vegetation associated with field boundaries and along the Liffey screen views to the site of the proposed development.

Sensitivity of receptor

Low.

Magnitude of change

No Change.

Significance of effects

No Change.

Figure 12.6 Viewpoint No. 4.

Description of existing view

View from local road off the R407 (Clane-Sallins Road) looking west generally towards the site of the proposed development. Roadside hedgerow vegetation confines views to the road itself at this location. There are some gaps in the hedgerow where field access gates occur which allow views across the agricultural fields.

Approximate Distance to site boundary

300m

Effects of the proposed development on the existing view

Extensive existing tree and hedgerow vegetation located to the field boundary which adjoins the River Liffey is located in the background and screens views to the proposed development. It's noted that glimpses are possible to the existing Alexandra Walk residential development to the left of the view.

Sensitivity of receptor

Low

Magnitude of change

Low

Significance of effects

Slight

Figure 12.7 Viewpoint No. 5.

Description of existing view

View from local road off the R407 (Clane-Sallins Road) looking west generally towards the site of the proposed development. Generally roadside hedgerow vegetation confines views to the road itself. At this location a gap in vegetation allow views across the agricultural fields.

Approximate distance to site boundary

300m

Effects of the proposed development on the existing view

Extensive existing tree and hedgerow vegetation located to the field boundary which adjoins the River Liffey is located in the background and screens views to the proposed development.

Sensitivity of receptor

Low

Magnitude of change

Low

Significance of effects

Slight

12.4.6.4 Visual Summary

The field visit identified the actual visibility of the proposed development. Potential views of the proposed development were found to be limited as it is well screened from the surrounding areas in general. While there may be locations in the immediate vicinity that will be visible the proposed mitigation landscape planting will help to visually integrate and partially screen proposed buildings. The transient views of road users are more limited to occasional glimpse through breaks in roadside hedgerows.

The introduction of the new elements will be not be uncharacteristic when set within the attributes of the receiving view. Such views will be slightly modified but on a localised level. The potential visual effects upon receptors considered from the 5 selected viewpoints range from No Change to Slight visual effects. Some of these receptor's initial views and visual effects will be reduced as the mitigation planting matures and integrates the proposed development. Across much of the wider study zone, the proposed development's lack of visibility will result in the majority of receptors experiencing No Change to their existing views throughout the proposed developments life span.

12.5 Mitigation and Remedial Measures

The mitigation measures have been developed in order to help, avoid, reduce and compensate for any predicted significant effects on both the landscape resource and visual amenity. Additional landscape and ecological enhancement measures will further help to improve the landscape quality and biodiversity of the site and provide positive contributions to the landscape character of the surrounding area. The proposed landscape works will be implemented within the first available planting season from the completion of the first phase of construction works. The planting will be maintained throughout the lifespan of the proposed development. The mitigation measures are three-fold:

- Retain site perimeter boundary tree lined hedgerows and hedgerows and internal sections of hedgerows in order to retain the visual screening offered to the proposed development.
- Boundary planting to mitigate landscape and visual impacts on surrounding visual receptors and designated/selected views;
- Streetscape and Open Space planting to mitigate impacts on visual amenity and landscape character.

Proposed planting comprises 855 No. trees and 1,865 linear metres of hedgerow. Mitigation measures are incorporated in the Landscape Masterplan which forms part of the planning submission for the proposed development.

12.5.1 Mitigation during Construction Phase

Existing vegetation was evaluated from the initial stages of the design process in order to retain in so far as possible existing vegetation. In accordance with the LAP zoning policies for this area, a protection zone was established along the River Liffey edge for public open space use. In addition, in this zone it is proposed to retain all trees, understorey and ground conditions intact, with the exception of crown raising to 2m to those trees along the River Liffey banks. Site engineering, drainage, ducting and other infrastructure has been designed to minimise impact on existing hedgerows and retain the biodiversity of these landscape features. Replacement planting is proposed as part of the mitigation measures and the landscape plans issued by Landmark Designs are included overleaf. The following mitigation measures are proposed:

- To protect trees and hedgerows to be retained, fell those trees identified in the Arboricultural Impact Assessment which are to be removed and grind out stumps in accordance with BS5837:2012;
- Implement tree protection measures for trees and hedgerows to be retained in accordance with BS5837:2012 before any demolition or construction works proceed;
- Where required strip and store topsoil in accordance with BS4428:1989 and BS3882:2007;
- Install proposed replacement and additional proposed planting and seeded areas in accordance with the Landscape Details issued by Landmark Designs included as overleaf.

With the exception of tall elements such as cranes and scaffolding, the use of site hoarding and direction lighting will mitigate visibility of the construction process. Proposed planting to mitigate visibility of the built elements is to be carried out in the linear public open space along the River Liffey within the first planting season following completion of Phase 1 of construction works. Retain and protect the existing landscape character and habitat along the River Liffey and within existing hedgerows to be retained and carry out proposed planting and landscape works in accordance with Landscape Details issued by Landmark Designs.

Figure 12.8 Landscape Masterplan issued by Landmark Designs

Proposed planting species include native tree and hedgerow species, non-native pollinators, deciduous and evergreen plants. In order to mitigate impacts on visual amenity and landscape character the landscape design will establish a protection zone along the Liffey boundary. The linear park will connect with the adjoining public open space and circulation network at Alexandra Manor and continue northwards to undeveloped lands and provide future pedestrian connections northwards. The linear park will provide both passive and active recreation and pedestrian circulation throughout the space and to adjoining public open spaces within the proposed development.

12.5.2 Mitigation during Operational Phase

As areas beyond the public open spaces become available for landscaping, the works shall be carried out within the first planting season following completion of each phase of works. All existing planting shall be continually protected and maintained as part of a maintenance programme. All existing retained vegetation shall undergo continual monitoring to ensure all works were carried out in accordance with recommendations of tree and landscape plans and reports. Continual maintenance of all mitigation planting will ensure proper establishment and control of weed and invasive species and replacement of plant failures within an 18-month maintenance and defects liability period.

12.5.3 Residual Impacts

By the very nature of the proposed residential development, it's physical presence will have a permanent effect and therefore will have a degree of residual impact to the northern edge of Clane. However, it is considered that with the establishment of proposed landscape and visual mitigation measures the proposed development will successfully integrate within the landscape setting over time. The additional tree and hedgerow planting proposed will have a residual positive impact in terms of increased landscape diversity, integration and structure. Following 10 years from planting the prominence of any visual intrusion will be gradually mitigated especially where the zoned lands to the north west of the proposed site are also developed for residential purposes.

12.5.4 Interactions

12.5.4.1 Biodiversity

A number of sections of internal hedgerows will be removed to facilitate the Proposed Development. This will impact on habitats supported by this existing vegetation and the biodiversity value of the site at present. Proposed planting, including native species, is shown in the landscape plans by Landmark Designs Ltd, included at Figure 12.8.

12.5.4.2 Land, Soils and Geology

There is a potential for importation of soil to the subject site to impact on the land in terms of quality of soil however suitable mitigation measures, i.e. working in accordance with the industry best practice BS4428:1989 and BS3882:2007, will avoid this impact.

12.5.4.3 Air, Dust and Climate Factors

Proposed trees and vegetation, illustrated in the proposed Landscape Plans by Landmark Designs Ltd, included at Figure 12.8, may have a positive impact on the air quality and climate in the Capdoo area.

12.5.4.4 Cultural Heritage and Archaeology

The development will not be visible from Alexandra Bridge.

In conclusion, detailed mitigation measures are proposed in the above interactions and implementation of these mitigation measures and resultant interaction with Landscape & Visual Amenity will be minor.

13.0 INTERACTIONS BETWEEN ENVIRONMENTAL FACTORS

13.1 Introduction

This section of the EIAR has been prepared by Hughes Planning and Development Consultants in association with the various EIAR consultants. More specifically, this chapter of the EIAR was prepared jointly by Mr. Kevin Hughes, Director, and Ms. Margaret Commane, Associate, with Hughes Planning and Development Consultants.

Mr. Kevin Hughes of Hughes Planning and Development Consultants, graduated from University College Dublin (UCD) with a Masters in Regional and Urban Planning (MRUP) in 2002, having previously completed a Bachelor of Arts Degree in Sociology from National University of Ireland in 1999. Kevin has over 18 years professional experience in the field of planning and development consultancy, which has included providing consultancy services in respect of several major urban regeneration projects including EIA. Kevin is currently the Director of Hughes Planning and Development Consultants.

Ms. Margaret Commane of Hughes Planning and Development Consultants, graduated from University College Cork (UCC) with a Masters in Planning and Sustainable Development (MPLAN) in 2012, having previously completed a Bachelor of Arts Degree in Geography and Legal Science from National University of Ireland in 2010. Margaret has over 7 years professional experience in the field of planning and development consultancy, which has included providing consultancy services in respect of several major urban regeneration projects including EIA. Margaret is currently an Associate in the Practice of Hughes Planning and Development Consultants.

The preceding Chapters 4.0 to 12.0 of this EIAR identify the potential environmental impacts that may have occur as a result of the proposed development in terms of Population and Human Health; Biodiversity; Lands, Soils, Geology and Hydrogeology; Water; Noise and Vibration; Air Quality and Climate; Material Assets; Archaeology, Architectural and Cultural Heritage; Landscape and Visual Amenity. All of the potential significant effects of the proposed development and the measures proposed to mitigate them have been outlined in the preceding chapters of this report. However, for any development with the potential for significant environmental effects there is also the potential for interaction amongst these potential significant effects. The result of interactive effects may exacerbate the magnitude of the effects or ameliorate them, or have a neutral effect. The purpose of this chapter is to identify and draw attention to interactions and interdependencies between the various chapters of this EIAR and associated topic specific assessments.

As previously stated, the scoping process of this EIAR occurred concurrently with the masterplanning process. As members of the design team contributed to this EIAR, detailed elements of the scheme evolved. The relevant consultants liaised with each other and the project architects, engineers and landscape architects where necessary to review the proposed scheme and incorporate suitable mitigation measures where necessary. For example, the retention of existing hedgerows informed the open space provision and the landscaping type throughout the site as well as the development layout, while following a road safety audit alterations were made to the road layout. Most of the interactions informed the design approach undertaken by the project architect in the first instance and were considered to be design considerations and site constraints.

13.2 Impact Definitions

Section 3.7.7 of the *Draft Guidelines on the Information to be Contained in Environmental Impact Statements* published by the EPA provides guidance on how to measure and define potential impacts on the environment. The following assessment criteria have been used to assess significant interactions:

Impact Definition	**Impact Definition**
Neutral	An interaction which does not affect the environment
Positive	An interaction which improves the quality of the environment
Negative	An interaction which reduces the quality of the environment
Significance	**Definition**
Imperceptible	*Capable of measurement but without noticeable consequences*
Not Significant	*Causes noticeable changes in the character of the environment but without noticeable consequence*
Slight	*Causes noticeable changes in the character of the environment without affecting sensitivity*
Moderate	*Alters character of environment consistent with existing and emerging trends*
Significant	*By its character, magnitude and duration or intensity alters a sensitive aspect of the environments*
Profound	*Obliterates sensitive characteristics*

Table 13.1 Assessment criteria utilised in assessing the significance of interactions

13.3 Summary of Principal Interactions

The following are the interactions anticipated from the proposed development:-

Subject Interaction	**Interaction With**	**Interactions/Inter-Relationships**	**Impact *Significance***
Population & Human Health	Air Quality & Climate	Construction vehicles, generators etc., may give rise to some CO2 and N2O emissions. However, due to the short-term and temporary nature of these works the impact on climate will not be significant.	Neutral *Slight*
Population & Human Health	Biodiversity	There is potential for disturbance to breeding birds to occur during initial construction stages. Site clearance will take place outside of the breeding season (March 31st to September 1st) to avoid direct injury and disturbance to breeding birds.	Neutral *Not Significant*
Land, Soils, Geology & Hydrogeology	Surface Water	Contamination of soils and groundwater can indirectly lead to surface water contamination. The mitigation measures listed in Sections 6.7 and 6.9 of this document will prevent discharge of contaminants via soils and groundwater to surface water. Groundwater can act as baseflow to nearby surface water courses. However, it not considered that the Proposed Development will impact on baseflow to water courses in the area	Neutral *Not Significant*

		for a number of reasons and factors, including, but not limited to, the long-term drainage design in accordance with the GDSUDS.	
Land, Soils, Geology & Hydrogeology	Air Quality & Climate	During the construction phase, dust emissions may potentially arise from soil erosion. The mitigation measures listed under Sections 6.7 and 6.9 of this document, ensure that soil erosion and, indirectly, dust emissions are minimised. Further mitigation measures are also detailed in Chapter 9.0 – Air Quality. Soils act as both sources and sinks for greenhouse gas emissions (GHGs). Disturbance of soils will be minimised as much as possible as part of the control measures outlined in Section 6.7 of this document.	Neutral *Not Significant*
Land, Soils, Geology & Hydrogeology	Population & Human Health	Dust emissions during construction can potentially impact on human health. The potential for impact on ambient air quality and effects on human beings/health, arising indirectly from soil erosion and resulting dust emissions during the construction phase of development, has been considered in Chapter 9.0 of this document. Mitigation measures will ensure that any potential impact is minimized. Groundwater is often used as a potable water supply. There will be no impact on groundwater potable water supplies as a result of the proposed Development.	Neutral *Not Significant*
Land, Soils, Geology & Hydrogeology	Biodiversity	Dust emissions during construction can cause temporary smothering of vegetation. The potential for effects on biodiversity, arising indirectly from soil erosion and resulting dust emissions during the construction phase of development, has been considered in Chapters 5.0 and 9.0 of this document.	Neutral *Not Significant*
Water	Population & Human Health /Material Assets – Water Supply	Water is abstracted for public supply from the River Liffey at Leixlip, located downstream of the proposed Development Site. There will be no impact on potable water supplies arising from discharges from the proposed Development either during the construction or long-term operational phases due to the inherent design and mitigation measures proposed during site development and construction.	Neutral *Not Significant*
Water	Biodiversity	Reduced water quality can cause effects on aquatic ecological receptors. Water quality will not deteriorate as a result of the proposed Development either during the construction or long-term operational phases due to the inherent design and mitigation measures proposed during	Neutral *Not Significant*

		site development and construction.	
Water Supply	Human Beings	Temporary disruption of potable water supply to existing users during connection works for the proposed Development has been considered. Pressure on water supply due to additional users in the long term has also been addressed. Mitigation measures to reduce water usage have been designed into the proposed development. Local water treatment capacity has been upgraded recently by Irish Water.	Neutral *Not Significant*
Foul Water	Soils, Geology &Hydrogeology	Foul drainage infrastructure has the potential to interact with soils and groundwater in terms of potential leakage to these media. Drainage will be designed in accordance with the requirements of the Building Regulations and relevant IW Codes of Practice.	Neutral *Not Significant*
Air Quality & Climate	Population & Human Health	Poor air quality can affect human health. Potential adverse effects are not anticipated during either the site development or long term operational phase, provided preventative mitigation measures during site development and construction phases are implemented. No long term effects on human health via impact on air quality are anticipated.	Neutral *Not Significant*
Air Quality & Climate	Material Assets – Property/Amenity	Dust deposition during construction can have potentially temporary adverse effects on property and amenity. Mitigation measures outlined for the site development and construction phases will ensure that nuisance dust is avoided and minimised throughout the duration of the development works.	Neutral *Not Significant*
Air Quality & Climate	Biodiversity	Air quality impacts can affect ecological receptors. The potential dust risk arising from nuisance dust during construction on features of local importance such as hedgerows has been assessed. Mitigation measures proposed will ensure that the effects are not significant.	Neutral *Not Significant*
Noise & Vibration	Health	Construction noise and vibration sources can temporarily potentially impact on human beings in terms of noise disturbance. However, a detailed CEMP incorporating mitigation measures will ensure that any potential effects are not significant. No long term effects are anticipated as the proposed Development is similar to existing development in the area.	Neutral *Not Significant*
Noise & Vibration	Biodiversity	Construction noise has the potential to impact on fauna in terms of temporary disturbance.	Neutral *Not Significant*

Traffic & Transportation	Noise	Increased traffic flows can give rise to traffic related noise and effects on human beings. The impact of traffic related noise on the existing ambient sound environment is expected to be imperceptible with no effect anticipated on local residents.	Neutral *Not Significant*
Traffic & Transportation	Air Quality & Climate	Increased traffic flows can give rise to traffic related air quality impacts and effects on human beings. The impact on ambient air quality levels is expected to be imperceptible with no effect anticipated on local residents. In terms of climate change, the proposed Development has been designed to encourage cycling and walking by providing routes and infrastructure. A Mobility Management Plan will be implemented.	Neutral *Not Significant*
Traffic & Transportation	Human Beings - Safety	Increased traffic can potentially give rise to safety issues. A road safety audit has been carried out on the proposed development and recommendations have been incorporated into the proposed design where necessary.	Neutral *Not Significant*
Material Assets – Services Infrastructure	Soils and Geology	Trench excavations to facilitate site service installation will result in exposure of subsoils to potential erosion and subsequent sediment generation. Mitigation measures are outlined in Chapter 6 Land & Soils (i.e. service trenches to be backfilled as soon as practicable to minimise potential erosion of subsoils).	Neutral *Not Significant*
Material Assets – Services Infrastructure	Human Health	A risk to the human health of the installer from built services can occur as a result of any excavation work in areas where built services exist, through coming into contact with live electricity lines or damaging live gas mains. Health and safety of workers will fall under the remit of the contractors appointed who will be required to comply with relevant Health and Safety legislation. From the perspective of the end user of the networks the risks to human health include: Gas leaks or explosions. The installation of services is tightly monitored and controlled by Gas Networks Ireland to ensure the protection of human health. Therefore, the risk of effect on human health is not considered significant. Loss of supply. This is a managed process that is the responsibility of the individual utility supplier and emergency plans will be in place. The effect is therefore considered brief and not significant.	Neutral *Not Significant*

		With the implementation of the aforementioned mitigation measures, the impact of the proposed built services on human health is likely to be negligible.	

Table 13.2 Summary Table of Principal Interactions between topics addressed by this EIAR.

13.4 Cumulative Impacts

The cumulate effects with other existing and/or approved projects in the area have also been considered to determine whether these could be sufficient to generate impacts of significance on the environment. Any predicted specific cumulative impacts are outlined in the various EIAR chapters, and tend to be temporary; related to the construction period; and manageable by way of mitigation. No significant interactions are envisaged in terms of interactions arising from cumulative impacts.

13.5 'Do Nothing' Scenario

If the proposed project does not proceed, there will be no cumulative impacts arising.

13.6 Mitigation and Monitoring Measures

It is not proposed that any mitigation or monitoring will be undertaken specifically for cumulative impacts.

14.0 EIAR MITIGATION AND MONITORING MEASURES

14.1 Introduction

This section of the EIAR has been prepared by Hughes Planning and Development Consultants in association with the various EIAR consultants. More specifically, this chapter of the EIAR was prepared jointly by Mr. Kevin Hughes, Director, and Ms. Margaret Commane, Associate, with Hughes Planning and Development Consultants.

Mr. Kevin Hughes of Hughes Planning and Development Consultants, graduated from University College Dublin (UCD) with a Masters in Regional and Urban Planning (MRUP) in 2002, having previously completed a Bachelor of Arts Degree in Sociology from National University of Ireland in 1999. Kevin has over 18 years professional experience in the field of planning and development consultancy, which has included providing consultancy services in respect of several major urban regeneration projects including EIA. Kevin is currently the Director of Hughes Planning and Development Consultants.

Ms. Margaret Commane of Hughes Planning and Development Consultants, graduated from University College Cork (UCC) with a Masters in Planning and Sustainable Development (MPLAN) in 2012, having previously completed a Bachelor of Arts Degree in Geography and Legal Science from National University of Ireland in 2010. Margaret has over 7 years professional experience in the field of planning and development consultancy, which has included providing consultancy services in respect of several major urban regeneration projects including EIA. Margaret is currently an Associate in the Practice of Hughes Planning and Development Consultants.

The central purpose of EIA is to identify potentially significant adverse impacts at the pre-consent stage and to propose measures to mitigate or ameliorate such impacts. This chapter of the EIAR document sets out a summary, for ease of reference, of the measures outlined within the individual chapters of this EIAR document which are proposed as mitigation and for monitoring during the construction and operational phases of the proposed development. All measures included below form part of the proposed development and will be implemented in full.

It is intended that this chapter of the EIAR document will provide a useful and convenient summary to the competent/consent authority of the range of mitigation and monitoring measures proposed.

14.2 Mitigation and Monitoring Measures

The following provides a list, for ease of reference, of the mitigation and monitoring measures recommended in each chapter of the EIAR.

14.2.1 Population and Human Health

Construction Phase

All standard health and safety procedures will be implemented at every stage of this project. The Main Contractor for the project is responsible for the method in which the demolition and construction works are carried out and to ensure that best practices and all legal obligations including Local Authority requirements and Health and Safety legislation are complied with. Further to this, Building Regulations will also be adhered to during the construction phase.

A range of construction related remedial and mitigation measures are proposed throughout this EIAR document with reference to the various environmental topics discussed under each. These measures seek to ensure that any likely significant adverse environmental impact on humans during the construction phases are either ameliorated to have an acceptable level of impact or avoided altogether. Included in these measures is the requirement that a detailed construction traffic management plan be prepared by the Contractor and agreed with Kildare County Council as the Road Authority prior to commencing works on the public road. This Construction Traffic Management Plan will include

restrictions on deliveries and access to the construction site, typically both will be via Brooklands Housing Estate Road to avoid use of the local Road serving Alexandra Walk. Further, measures with regards to noise and dust abatement covered elsewhere within this EIAR will be implemented during construction and will limit impacts on population and human health.

Further to the above, working hours on site will be as such that the residential amenity of adjacent residences is not unreasonably impacted upon. They will be agreed with the Council in full as part of the required construction management plan.

As a result of the implementation of the abovementioned measures, the impacts of the construction phase of the development on population and human health are not anticipated to be significant. Furthermore, all impacts will be temporary in nature.

Operational Phase

The mitigation measures relating to the operation phase of the development concerning traffic, transport, noise, vibration, water, air and dust quality and landscaping as set out in this EIAR (and listed in Chapter 14.0) will be carried out in full to minimise impacts on residents of the development, adjacent residents and human health.

With regards to potential flooding, the following mitigation measures have been incorporated into the proposed scheme, as per the recommendation of the Site Specific Flood Risk Assessment, prepared by IE Consulting:

- The finished ground levels (road levels, etc) are to be constructed to a minimum level of 0.15m above the maximum predicted 0.1% AEP flood level – i.e. 65.18m + 0.15m = 65.33m OD;
- The finished floor levels are to be constructed to a minimum level of 0.30m above the maximum predicted 0.1% AEP flood level – i.e. 65.18m + 0.30m = 65.48m OD; and
- The proposed development incorporates an appropriately designed stormwater management system that limits stormwater runoff from the site to existing pre-development runoff rates.

Monitoring

There is no other ongoing monitoring required in relation to the effect of the proposed development on the population and human health.

14.2.2 Biodiversity

Construction Phase

Loss of Habitat – mitigation by offset

A ‘woodland regeneration area’ is included in the landscaping plans. This will allow the existing scrub vegetation to mature over time and will bolster the integrity of the riparian corridor and its wildlife value. 75% of the native hedgerows on the site are to be retained and reinforced within the project design. There will be significant hedgerow replacement to the rear of houses 76-93 and tree planting throughout the development to be undertaken as outlined in the landscaping plan prepared by Landmark Designs While taking time to mature, it is envisaged that the extent of new planting, along with the retention of existing features, will result in a net neutral impact to biodiversity.

Mortality to animals during construction – mitigation by avoidance

Deliberate disturbance of a bird’s nest is prohibited unless under licence from the National Parks and Wildlife Service. The removal of vegetation will be undertaken outside the nesting period (March to August inclusive). Where this is not possible, vegetation must be inspected for the presence of nests. If no nest is found, vegetation can be removed within 48 hours. Where a nest is found, vegetation can only

be removed after young birds have fledged, or under licence.

Mortality to animals during construction (bats) – mitigation through avoidance

The following is taken from the bat report:

> *Mature trees with bat roost potential will be felled in late autumn. This would include the months of September and October. Should the trees be felled in winter, an evaluation of the trees shall be carried out by a bat specialist prior to felling. Surveying in winter may not be possible by way of a bat detector assessment and a visual examination undertaken by a licensed bat specialist would be required. This would most probably necessitate access to height and the use of a fibrescope if nay trees are considered to have good potential for hibernation.*

Pollution during construction – mitigation through avoidance

A Construction Method Statement will be prepared, and which should include pollution prevention measured in accordance with best practice guidelines from Inland Fisheries Ireland (2016). This should identify the location of the site compound, storage areas for potentially polluting substances, and specific measures to prevent the loss of silt-laden water to any water course. It should include the installation of suitably designed silt traps, so that any discharge is only of clean, silt-free water.

Operational Phase

Tree damage – mitigation by avoidance

To avoid damage to trees the developer will follow the guidance from the National Roads `Authority in establishing root protection areas (RPA) along hedgerows to be retained. The NRA gives the following equation for calculating the root protection area (RPA) (NRA, unknown year):

RPA(m2) = π(stem diameter mm 12)/1,000) x2

The RPA gives the area around which there should be no disturbance or compaction of soil. This will be calculated for the largest tree within each hedgerow. Prior to construction this area will be clearly labelled ‘sensitive ecological zone’, fenced off with durable materials and instruction given to construction personnel not to disturb this buffer zone. As a rule of thumb this buffer zone should extend at least to the canopy of the trees concerned.

Artificial lighting – mitigation by reduction

The lighting plan has been reviewed by the bat ecologist to ensure that overspill to sensitive areas are avoided. Lighting can be minimised by the use of cowels and louvres as well as appropriate intensity bulbs. The following text is taken from the bat report:

> *Lighting must be designed that will limit overspill from the required area for illumination and prevent light pollution. This should aim to avoid mature trees and the river vegetation in particular but must also avoid illumination of potential roost sites such as the buildings to the north of the site. LED is the most energy efficient source available and wherever a permanent source of night lighting is unessential, it should be motion-activated.*

The report also recommends that enhancement measures be undertaken including the erection of bat boxes and the planting of nectar-producing plants. Specific details are provided in the report.

Monitoring

Monitoring is required where the success of mitigation measures is uncertain or where residual impacts may in themselves be significant. After mitigation, no significant effects are likely to arise as a result of

this development to flora and fauna and so monitoring is not required.

14.2.3 Land, Soils, Geology and Hydrogeology

Construction Phase

The CEMP will include the following specific measures with regard to soils and groundwater (further measures for surface water that may also apply here are detailed in Chapter 7.0):

The works programme for the site development stages will take account of weather forecasts and predicted rainfall in particular. Large excavations and movements of subsoil or vegetation stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

Dewatering

- Dewatering will be conducted whereby soil erosion does not occur as a result. In this regard, removed liquid may be directed to suitable wooded buffers where possible or alternatively settlement ponds.
- Dewatering will be discontinued where signs of erosion occur and under heavy rain conditions where infiltration slows down.

Soil Compaction and Erosion

The site development and construction works will be phased. This measure will inherently prevent the potential for large scale soil erosion.

All stripping of topsoil and excavation works will be completed in a controlled manner.

Topsoil and subsoil spoil heaps will be covered and protected from adverse weather conditions.

Construction traffic will be confined to pre-determined haul routes to minimise soil compaction across the site.

Disturbed sub-soil layers will be stabilised as soon as practicable (e.g. backfilling of service trenches, construction of road capping layers, construction of building foundations and completion of landscaping). The duration that subsoil layers are exposed will be minimised in order to mitigate against weather effects.

Accidental Spills and Leaks

Refuelling and servicing of construction machinery will take place in a designated hard-stand area which is also remote from any surface water ditches.

All oils, fuels, paints and other chemicals will be stored in a secure bunded hardstand area to prevent ingress into soils and groundwater.

Operational Phase

No specific additional mitigation measures are required with regard to soils, geology and hydrogeology.

Monitoring

Monitoring will be required during the construction phase as part of the CEMP. The appointed contractor will draw up a Construction Method Statement (CMS) which will incorporate all of the avoidance and mitigation measures and explain how each of these will be implemented.

The following relates to soils, geology and hydrogeology:

- Pre-commencement monitoring to ensure that soil erosion preventative controls are in place, functioning, inspected and approved;
- Regular inspections to ensure that works are completed in a controlled manner;
- Regular inspection of ground conditions during works, ensuring stability of excavations and timely filling;
- Regular inspection of stockpiles in terms of protection, height and number;
- Regular inspection of chemical and fuel storage arrangements and re-fuelling areas;
- Testing of foul sewerage for leaks and defects prior to operation.
- Record-keeping.

Cut and fill will be balanced therefore all soils and subsoils excavated during the course of the site development works will be reinstated in the completed Development.

No monitoring is proposed for the long-term operational phase of development.

14.2.4 Water

Construction Phase

Many of the mitigation measures outlined in Section 6.7 (under Land, Soils, Geology and Hydrogeology) are similarly being proposed for the protection of surface waters during construction. Due to the sensitivity of receiving waters, the following mitigation measures, will also be implemented under the CEMP to manage potential impacts to hydrology during construction stages, and they include:

- Interception, channelling and discharge of surface water from sumps, excavations and exposed soil surfaces via silt traps and / or settlement lagoons;
- Cordoning off of the drainage ditchs to protect from spillages and contamination form construction materials;
- Construction of silt traps, settlement lagoons / ponds and hydrocarbon interceptors at sensitive outfalls in the early stage of the construction project.
- Construction of cut-off ditches to prevent surface water runoff from entering excavations;
- Placing of granular materials over bare soil in the vicinity of watercourses in order to prevent erosion of fines and rutting by site traffic;
- Storage of fuel, oils and chemicals on impermeable base away from drains and within designated construction compound areas secured against vandalism and unauthorized entry. Fuel storage areas will be bunded to provide adequate retention capacity in the event of a leak or spill occurring;
- Re-fuelling of plant and vehicles on impermeable surfaces away from drains;
- Provision of spill kits, oil booms or oil soakage pads on the site and in particular at areas of high risk with regard to spillage;
- Raw or uncured waste concrete will be disposed of by removal from the site;
- Before release to the environment, wash down water from exposed aggregate surfaces, cast-in-place concrete and from concrete trucks will be treated to a level which will ensure that total suspended solids in discharges to surface waters (including drains) will not exceed 25mg/l. Furthermore, wash out water will not be released to the environment until it has reached a neutral pH;
- Only the chute of the concrete delivery truck will be cleaned on site, using the smallest volume of water necessary. Concrete trucks will be directed back to their batching plant for washout;
- Clearly visible signs will be placed in prominent locations close to concrete pour areas, stating that washout of concrete lorries is not permitted on the site;
- The arrangements for concrete deliveries to the site will be discussed with suppliers before commencement of work, agreeing routes, prohibiting on-site washout and discussing emergency procedures;

- So as to avoid spillage, concrete will not be transported around the site in open trailers or dumpers. All concrete used will be pumped directly into the shuttered formwork from the delivery truck;
- Concrete pours will be avoided where prolonged periods of heavy rain are forecast and covers will be available for freshly placed concrete to avoid the surface washing away in heavy rain;
- Installation of wheel wash and plant washing facilities with fluid retention for appropriate treatment and disposal;
- 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 Acts of 1996 and 2001, and,
- Implementation of waste minimisation measures with correct handling, storage and disposal of waste.

Operational Phase

The following measures with regard to fluvial flood risk have been recommended by IE Consulting and will be implemented as part of the proposed Development:

- Proposed finished ground levels (road levels, etc) will be constructed to a minimum level of 0.15m above the maximum predicted 0.1% AEP flood level upstream of the site – i.e. 65.18m + 0.15m = **65.33m OD**.
- Proposed finished floor levels will be constructed to a minimum level of 0.30m above the maximum predicted 0.1% AEP flood level upstream of the site – i.e. 65.18m + 0.30m = **65.48m OD**.

Furthermore, with regard to potential on-site pluvial flooding provision, the following will be provided:

- The surface water network, attenuation storage and site levels are designed to accommodate a 100 year storm event and include climate change provision.
- Floor levels of houses are set above the 100 year flood levels by a minimum of 0.5m for protection. For storms in excess of 100 years, the development has been designed to provide overland flood routes along the various development roads towards the surface water drainage outfall.

A contract will be entered into with a suitably qualified contractor for maintenance of the attenuation system, Hydrobrake and full retention fuel / oil separator noted above.

Monitoring

Proposed monitoring during the site development and construction phase set out in Section 6.9 relating to soils, geology and hydrogeology are equally applicable to surface water. Additionally, the following will be completed:

- Monitoring and inspection of sediment control measures e.g. settlement ponds and discharges (pH, visual inspection and sediment content).
- Monitoring cleanliness of adjacent road surfaces to prevent sediment run-off to gullies and road drains and implementation of dust suppression and wheel wash facilities to prevent uncontrolled build-up on roads.

During the operational phase an inspection and maintenance contract will be implemented in relation to the proposed Class 1 full retention fuel / oil separators.

14.2.5 Noise and Vibration

Construction Phase

The use of preformed built elements is a significant mitigating factor to reduce the duration of the construction phase and in turn the duration of the construction-related noise impacts.

A CEMP including for noise and vibration will be developed prior to the commencement of site development works. As the construction equipment/process may change subject to the successful tenderer's proposal, the plan will, where necessary to achieve the threshold values/criteria listed in Table 8.8, take account of mitigation measures set out in Section 8 of BS5228: Part 1: 2009 +A1:2014 - Noise Control on Construction and Open Sites. Section 8 identifies measures such as substitution, modification, use of enclosures and siting of equipment in order to minimise impact.

Other general measures to be contained in the plan are as follows:

- The operation of certain pieces of equipment should be managed through monitoring and timing of use in order to ensure that the threshold values/criteria specified are complied with.
- Temporary acoustic screening should be considered along the boundaries with Brooklands where works take place close to the boundary. As a general rule of thumb, it is recommended that temporary screening break the "line of sight" from the sources to the windows of the nearest NSLs where possible.
- During the construction phase all equipment will be required to comply with noise limits set out in EC Directive 2000/14/EC and the 2005/88/EC amendment on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors. The directive covers equipment such as compressors, welding generators, excavators, dozers, loaders and dump trucks.
- A site representative will be appointed for matters related to noise and vibration.
- Any complaints received will be thoroughly investigated.
- A written complaints log will be maintained by the site manager. This will at a minimum record the name of the complainant, date and time of the complaint and a record of the details of the complaint including the date and time of when the effect was observed. This will ensure that the concerns of local residents who may be affected by site activities are considered during the management of activities at the site.
- Monitoring of typical levels of noise will be conducted during critical periods at sensitive locations to ensure that excessive levels above the threshold value for daytime are addressed immediately.
- Suitable mitigation measures taken at the time of excessive noise/complaints such as restricting the use of noisy equipment will be taken.

As a precautionary measure, vibration monitoring is proposed during the construction phase as part of the CEMP at the nearest sensitive receptors when sources likely to cause vibration will be in use. In this regard, test monitoring will be conducted with the equipment on at low levels before increasing incrementally to operational levels. Works will be ceased and mitigation measures implemented during the construction phase where monitoring detects vibration levels associated with the construction phase of the facility above the relevant guidance values.

Operational Phase

There are no adverse impacts or related effects anticipated with the operational phase of the development, therefore no mitigation measures are proposed.

Monitoring

Construction Phase

The contractor will be required to ensure construction activities operate within the noise and vibration limits set out within this assessment. The contractor will be required to undertake regular noise monitoring at locations representative of the closest NSLs to ensure the relevant criteria are not exceeded. Vibration test monitoring will be required as a precautionary measure during piling to ensure that limits are not exceeded at the nearest sensitive receptors.

Operational Phase

No monitoring is proposed during the operational phase.

14.2.6 Air Quality and Climate

Construction Phase

A CEMP including for dust management will be developed prior to the commencement of site development works. The principal objective of the Plan will be to ensure that dust emissions do not cause significant dust soiling on nearby residential receptors. Key features are summarised as follows:

- A designated Site Agent will be assigned overall responsibility for Dust Management;
- The design of the site development and construction programme will consider dust impact management and choose design approaches to minimise dust emissions;
- An effective training programme for site personnel will be implemented for the duration of the site development works and construction stages;
- A strategy for ensuring effective communication with the local community will be developed and implemented;
- A programme of dust minimisation and control measures will be implemented and regularly reviewed;
- A monitoring programme will be implemented.

The design of the site development and construction programme and the location and layout of the construction compound and the storage of materials will be carefully planned to ensure that air quality impacts are minimised.

The following is a summary of the main mitigation features of the project and the specific mitigation measures which will be employed in order to minimise emissions from the activity and the associated impacts of such emissions:

- Activities with potential for significant emissions will wherever possible be located at a position as far as possible removed from the nearest residential receptors;
- The areas on site which vehicles will be travelling on will generally be hard-surfaced or compressed ground thus significantly reducing the potential for dust emissions from the vehicles;
- Stock piles of soil and sub-soil and activities potentially giving rise to soil erosion will be strictly controlled (Refer to Chapter 6.0);
- The construction compound area will have hard standing areas to minimise dust generation from wind-blow;
- In order to minimise the potential for wind-generated emissions from material storage bays, these bays will be oriented away from the dominant wind direction to minimise the effects of wind on release of dust and particulate;
- Existing vegetation along the boundaries will be retained as screening;

- The relatively mixed particle size associated with the activity means that the particles will generally be deposited close to the emission source and will not travel significant distances away from the site;
- Fixed and mobile water sprays will be used to control dust emissions from material stockpiles and road and yard surfaces as necessary in dry and/or windy weather;
- A wheel-wash will be used where necessary to reduce mud deposition on local roads;
- A daily inspection programme will be formulated and implemented in order to ensure that dust control measures are inspected to verify effective operation and management, and,
- A dust deposition monitoring programme will be implemented at the site boundaries for the duration of the construction phase in order to verify the continued compliance with relevant standards and limits.

Operational Phase

No specific additional mitigation measures are proposed with regard to the long term operational phase of development. The proposed Development has inherent mitigating factors within the design to minimise impact in terms of GHGs and other pollutants.

Monitoring

Monitoring of dust deposition using standard Bergerhoff dust gauges during the site development and construction phases at the boundaries with sensitive receptors will be completed to ensure that dust minimisation measures are operating effectively. The monitoring results will be regularly reviewed to inform any changes required to activities on site.

14.2.7 Material Assets

Construction Phase

A site-specific CEMP will be developed and implemented during the construction phase. Implementation of the measures outlined in this plan will ensure that the potential impacts of the proposed Development do not occur during the construction phase.
Relocation of existing overhead ESB lines will be fully coordinated with ESB Networks to ensure interruption to the existing power network is minimised (e.g. agreeing power outage to facilitate relocation of cables). Ducting and / or poles along the proposed relocated route will be constructed and ready for rerouting of cables in advance of decommissioning of existing overhead power lines.

Similarly, connections to the existing gas and telecommunications networks will be coordinated with the relevant utility provider and carried out by approved contractors.

Operational Phase

No monitoring is proposed during the operational phase.

Monitoring

No specific monitoring is proposed in relation to electrical, gas and telecommunications infrastructure.

Reinstatement of any excavations, trenches etc. relating to the provision of electrical, gas and telecommunications connections is to be carried out in accordance with the relevant utility provider's requirements.

14.2.8 Archaeology, Architectural and Cultural Heritage

Construction Phase

As noted in Section 11.5.1.1, the only features of historical interest within the extent of the proposed

development lands are lengths of townland boundaries (CH-1). These will largely be retained or replanted except for short sections which will require permanent removal for vehicular and pedestrian access. It is considered that the removal of these short sections is acceptable, given that the greater lengths of these boundaries will be retained.

In terms of archaeological and archaeological heritage, there are no monuments or structures of interest located within, or in the immediate environs of, the proposed development lands, as discussed in Sections 11.5.1.2 and 11.5.1.3. In addition, a programme of Archaeological Testing was undertaken within the extent of the subject proposed development lands, as summarised in Section 11.3.2.5 and described in Appendix 11.1. A total of 30 trenches, of varying lengths and orientations, were excavated and no subsurface features of archaeological interest/potential were uncovered and no artefacts of interest were recovered. Consequently, as further noted in Section 11.5.1.2, it is considered that the subject proposed development lands are of very low/negligible archaeological potential and it is not considered likely that the proposed development will cause any impacts with respect to any features of archaeological heritage interest during the construction phase of the project.

Given the above, it is considered, from the overall perspective of Cultural Heritage, that no mitigation measures are required during the construction phase of the proposed development

Operational Phase

In terms of archaeological and archaeological heritage, there are no monuments or structures of interest located within, or in the immediate environs of, the proposed development lands. As noted in Section 11.5.2.2, the nearest archaeological monument is St. Brigid's Well (Site CH-2), located at a distance of 310m to the east of the subject proposed development lands, while, as noted in Section 11.5.2.3, the nearest Protected / NIAH-listed Structure is Abbeyland House (Site CH-3) located 255m to the east of the southernmost extent. These cannot be viewed from the subject lands due to the locations of existing residential units in the intervening areas. Consequently, it is considered, from the perspective of Archaeological and Architectural Heritage, that no mitigation measures are required following the completion of the proposed development.

In terms of Local History, the only features of interest within the extent of the subject development lands are townland boundaries and these will be largely retained or replanted, except for short sections to be removed for vehicular/pedestrian access. As noted in Section 11.5.2.1, the nature of these features is not visually identifiable, as they act as field boundaries and have no intrinsic elements which mark them out as townland boundaries. It is suggested that, in order to enhance the appreciation of these townland boundary features, that the following measures be implemented following construction of the proposed development:

1. Markers should be established at those locations where the townland boundaries are truncated by the proposed vehicular and pedestrian routes. The markers should include the names of the townlands and be erected on stone markers or plaques inserted into the footpaths

Monitoring

It is not considered that any monitoring measures are required at either construction or post-construction phase of the proposed development.

14.2.9 Landscape and Visual Amenity

Construction Phase

Existing vegetation was evaluated from the initial stages of the design process in order to retain in so far as possible existing vegetation. In accordance with the LAP zoning policies for this area, a protection zone was established along the River Liffey edge for public open space use. In addition, in this zone it is proposed to retain all trees, understorey and ground conditions intact, with the exception of crown raising to 2m to those trees along the River Liffey banks. Site engineering, drainage, ducting and other infrastructure has been designed to minimise impact on existing hedgerows and retain the biodiversity of these landscape features. Replacement planting is proposed as part of the mitigation measures and the landscape plans issued by Landmark Designs submitted with the application. The following mitigation measures are proposed:

- To protect trees and hedgerows to be retained, fell those trees identified in the Arboricultural Impact Assessment which are to be removed and grind out stumps in accordance with BS5837:2012;
- Implement tree protection measures for trees and hedgerows to be retained in accordance with BS5837:2012 before any demolition or construction works proceed;
- Where required strip and store topsoil in accordance with BS4428:1989 and BS3882:2007;
- Install proposed replacement and additional proposed planting and seeded areas in accordance with the Landscape Details issued by Landmark Designs submitted with the application.

With the exception of tall elements such as cranes and scaffolding, the use of site hoarding and direction lighting will mitigate visibility of the construction process. Proposed planting to mitigate visibility of the built elements is to be carried out in the linear public open space along the River Liffey within the first planting season following completion of Phase 1 of construction works. Retain and protect the existing landscape character and habitat along the River Liffey and within existing hedgerows to be retained and carry out proposed planting and landscape works in accordance with Landscape Details issued by Landmark Designs.

Proposed planting species include native tree and hedgerow species, non-native pollinators, deciduous and evergreen plants. In order to mitigate impacts on visual amenity and landscape character the landscape design will establish a protection zone along the Liffey boundary. The linear park will connect with the adjoining public open space and circulation network at Alexandra Manor and continue northwards to undeveloped lands and provide future pedestrian connections northwards. The linear park will provide both passive and active recreation and pedestrian circulation throughout the space and to adjoining public open spaces within the proposed development.

Operational Phase

As areas beyond the public open spaces become available for landscaping, the works shall be carried out within the first planting season following completion of each phase of works. All existing planting shall be continually protected and maintained as part of a maintenance programme. All existing retained vegetation shall undergo continual monitoring to ensure all works were carried out in accordance with recommendations of tree and landscape plans and reports. Continual maintenance of all mitigation planting will ensure proper establishment and control of weed and invasive species and replacement of plant failures within an 18-month maintenance and defects liability period.

Monitoring

There is no other ongoing monitoring required in relation to the effect of the proposed development on the landscape and visual amenity.