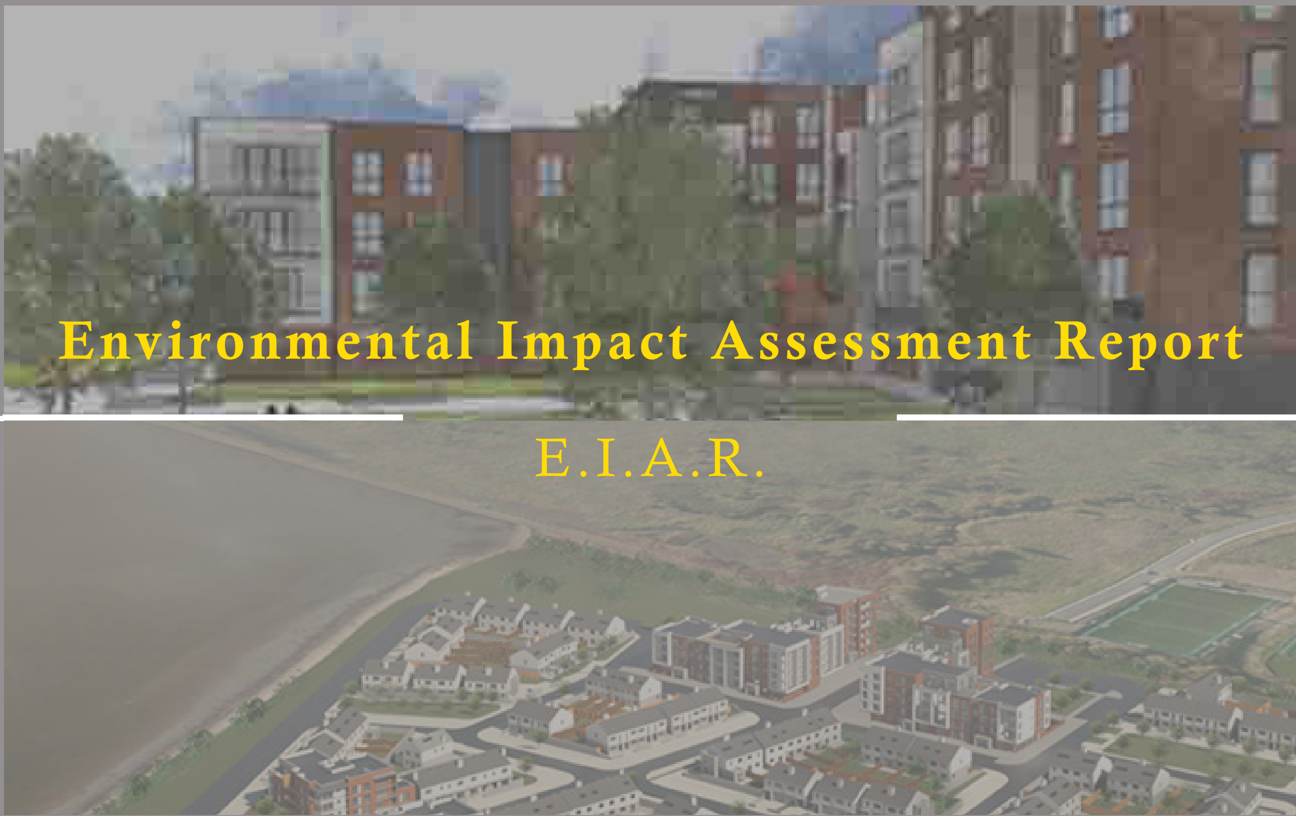

Environmental Impact Assessment Report

E.I.A.R.

CARCUR PARK, WEXFORD

Strategic Housing Development

Submitted on behalf of William Neville & Sons

August 2020

IAN DOYLE
planning consultant

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CONTRIBUTORS

The EIAR has been prepared and co-ordinated by Ian Doyle Planning Consultant. Specialist Inputs have been provided by the following Consultants:

Air Quality/Climate	AWN Consulting Engineers
Archaeology	Stafford McLoughlin Archaeology
Architectural Design	Reddy Architecture + Urbanism
Flora and Fauna	Deborah D'Arcy Ecologist
Landscape and Visibility	Paul Nolan A1 Design
Noise and Vibration	AWN Consulting Engineers
Soils/Water	Arthur Murphy
Town Planning	Ian Doyle Planning Consultant
Traffic	NRB Consulting Engineers

All experts involved in the preparation of environmental impact assessment reports are qualified and competent in their respective aspect of the environment. Details of qualifications, expertise and experience have been provided in Section 1.8 of this EIAR. Additional contributors are also discussed at the beginning of each chapter.

Chapter 1 Introduction

"The screening procedure should ensure that an environmental impact assessment is only required for projects likely to have significant effects on the environment". **Article (27) of Directive 2014/52/EU**

1.0 Background & Context

It is the intention of William Neville and Sons to create an exemplary, high quality residential quarter for Wexford Town and to establish landmark buildings, which will form a gateway to Wexford once the objective for a third bridge over the river Slaney is realized. The site is of strategic importance and so a plan-led approach, which demonstrates a comprehensive and long term solution to all potential issues, is required. Consequently, this EIAR has been prepared in respect of the entire landholding which covers an area of 13.84.Ha. A Master Plan approach has been adopted to facilitate the phasing of development over time, give guidance and direction to all potential issues and afford flexibility with regards to potential alterations to the proposed development on a phase by phase basis. The evolution of the Master Plan is clearly articulated by the Design and Access Statement prepared by Reddy Architecture+Urbanism. The Master Plan sets out parameters and guidance for the overall form of development, the general layout of built and open spaces, the disposition of buildings, location of key landmark buildings and the realization of transport related objectives of the Development Plan. The establishment of a Master Plan will ensure that the adjacent Natura 2000 sites and associated wildlife will be protected over subsequent developments.

1.1 Requirement for EIAR (Statutory Basis)

This Environmental Impact Assessment Report (EIAR) has been prepared to determine, evaluate and mitigate against any potential effects on the environment arising from the development proposal, which consists of a total of 413 residential units, two crèche facilities, a bird hide, 769 car parking spaces, a retail unit and associated infrastructure. The proposed development falls under Section 10 "Infrastructure Projects" described in Schedule 5 (Development for the Purpose of Part 10) Article 93 of the Planning and Development Regulations. Specifically Section 10(iv) which states that an EIAR is required for:

"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."

The subject site has a stated area of 13.84 hectares in size and is located in a built-up area (within the urban boundary of Wexford Town). The site is also located adjacent to EU designated Natura 2000 sites including the Slaney River Valley SAC (Special Area of Conservation) and the Wexford Harbour and Slobs SPA (Special Protection Area).

Circular letter PL 1/2017 issued by the Department of Housing, Planning Community and Local Government in May 2017, requires that all local authorities implement changes to EIA procedures as set out in Directive 2014/52/EU which amends Directive 2011/92/EU. 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 the 16th of May 2017. This EIAR has been carried out to meet the requirements of the new directive.

Scoping for this EIAR took place with Wexford County Council on the 11/01/2016. Pre planning discussions regarding Part V took place on the 28th April 2016 with a subsequent agreement letter issued by the council on the 2nd of September 2016. Numerous pre-planning discussions took place between the council and the applicant between 2019-2020.

Section 5 Consultation with An Bord Pleanala (ABP) as required by the Planning and Development (Housing) and Residential Tenancies Act 2016 has been complied with in full. A meeting between the project team, representatives of ABP and officials from Wexford County Council took place on the 17th of June 2020. The resultant recommendations and requirements have been incorporated into the proposed development.

1.2 Scope of EIAR

This EIAR has been coordinated by Ian Doyle Planning Consultant in associated with the above listed team of experts on behalf of William Neville & Sons. The scope and range of issues to be considered within this EIAR were determined following an initial scoping exercise undertaken by the assembled team of contributors listed above. In addition, preplanning discussions with the council have been ongoing throughout the design process including a multi-disciplinary meeting between the consultant team and their respective counterparts in the council for the purpose of scoping and identifying the core issues this EIAR is required to address (in accordance with Section 173(2) (a) of the Planning and Development Act 2000). This Environmental Impact Assessment Report ("EIAR") has been carried out in accordance with "Revised Guidelines on the information to be contained in Environmental Impact Statements Draft" and "Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)" published by the Environmental Protection Agency, Ireland in 2015 and 2003 respectively. The requirements of Part X of the Planning and Development Act, 2000 (as amended) and also Part 10 of the Planning and Development Regulations, 2001 (as amended) were also considered.

As required by the draft 2015 guidelines, in the interest of keeping the EIAR as "tightly focused" as possible, the scoping process includes an assessment of the prescribed environmental factors on the basis of "Unlikely", "Likely" and "Significant" potential effects as follows:

Table 1.0 Assessment of Potential Impacts on Prescribed Environmental Factors

Heading	Factor	Impact
Population and Human Health	Economic Activity Land-use Employment Settlement Patterns Social Patterns	Likely Likely Likely Significant Significant
Biodiversity	Habitats Breeding/Feeding/Roosting Areas Mammals & Birds Terrestrial/Aquatic/Marine Seasonality	Significant Significant Significant Likely Likely
Land & Soils	Land Soil Agricultural capability Geology	Likely Likely Unlikely Significant
Water	Ground/Surface/Estuarine/Marine Hydrogeology Physical Chemical Biotic Beneficial Uses	Significant Significant Likely Unlikely Unlikely Unlikely
Air	Air Quality Pollutants Odour Noise & Vibration Radiation	Likely Unlikely Significant unlikely
Climate	CFCs Acid Rain Thermal Pollution Climate change trends (macro and micro)	Unlikely Unlikely Unlikely Likely
Material Assets	Built services Roads and traffic	Likely Significant
Cultural Heritage	Known archaeological monuments including wrecks Areas of archaeological potential Architectural heritage Designated architectural heritage Significant architectural heritage Folklore and history sensitivities	Unlikely Likely Unlikely Unlikely Unlikely Unlikely

The Landscape	Landscape Character Landscape Context Views & Prospects	Likely Likely Significant

1.3 Scoped Out

Factors associated with headings; Population and Human Health, Biodiversity, Material Assets and The Landscape, will be covered in detail, with “no issues” or “potential impacts” removed from detailed assessment or “scoped out”. Some factors such as the agricultural capability of the land, potential for odor nuisance, radiation and architectural conservation/heritage do not require detailed assessment due to the characteristics of the receiving environment in the context of the proposed development and as such are not addressed in detail and have been scoped out. Some factors that have been scoped out do appear in places throughout the EIAR as secondary considerations.

Table 1.1 Scoped Out Environmental Factors		
Population and Human Health	None	None
Biodiversity	None	None
Land & Soils	Agricultural capability	Scoped out
Water	Chemical Biotic Beneficial Uses	Scoped out Scoped out Scoped out
Air	Odor Radiation	Scoped out Scoped out
Climate	CFCs Acid Rain Thermal Pollution	Scoped out Scoped out Scoped out
Material Assets	None	None
Cultural Heritage	Known archaeological monuments including wrecks Architectural heritage Designated architectural heritage Significant architectural heritage Folklore and history sensitivities	Scoped out Scoped out Scoped out Scoped out Scoped Out
The Landscape	None	None

1.4 Primary Environmental Factors to be assessed

Following the scoping process, the prescribed environmental factors with the most potential for impacts can be determined for assessment. The "scoped in" considerations can be grouped to form the relevant sections of the EIAR. For the purpose of this assessment the following headings have been grouped together to address the following considerations as presented by table 1.2 below.

Table 1.2 Assessment of Potential Impacts on prescribed environmental factors

Headings	**Primary Considerations**	**Impact**
Population and Human Health	Population Employment Education	Likely Likely Likely
Biodiversity	Otters Winter Water Birds Japanese Knotweed Shellfish	Significant Significant Significant Likely
Water	Tidal Flooding Surface Water Waste Water Water Supply	Significant Likely Likely Likely
Soils, and Geology	Contamination Imported materials	Likely
Air Quality & Climate	Dust	Significant
Noise and Vibration		Likely
Material Assets	Roads & Traffic	Significant
Cultural Heritage	Archaeological	Likely
Landscape	Visual impact Amenity Space	Significant Significant
Interactions between these factors		Significant

1.5 Other Assessments

As the site is located at the mouth of the river Slaney a ***"Site Specific Flood Risk Assessment"*** (SSFRA) was deemed to be required paying particular regard to the potential for Tidal/Coastal flooding. Only the key findings of the SSFRA are incorporated into this EIAR in the interest of avoiding duplication of assessment in accordance with the recommendations of the draft guidelines. The Slaney Estuary is both a Special Protection Area (SPA) and Special Area of Conservation (SAC) which are both Natura 2000 sites. Natura 2000 is a network of core breeding and resting sites for rare and threatened species, and some rare natural habitat types which are protected in their own right. It stretches across all 28 EU countries, both on land and at sea. The aim of the network is to ensure the long-term survival of Europe's most valuable and threatened species and habitats, listed under both the Birds Directive and the Habitats Directive. A separate "***Natura Impact Statement"*** has been carried out for the subject site and should be read in conjunction with this EIAR.

Both the***" Site Specific Flood Risk Assessment"*** and the "***Natural Impact Statement"*** are key considerations of this EIAR.

A report examining potential impacts of storm water on aquaculture in the estuary was carried out by Aquafact Ltd which concludes that storm water discharge will have no effect on estuary aquaculture.

1.6 Format and Structure of EIAR

The topics examined by this EIAR, following the above scoping process, are categorized under the environmental factors prescribed under the 2014 EIA Directive:

Population and Human Health
Biodiversity
Soils, Geology & Water
Air Quality & Climate
Noise and Vibration
Material Assets
Cultural Heritage
Landscape

The structure of this EIAR affords each relevant environmental factor a separate chapter as follows: A summary of the findings of each chapter is included in chapter 2 Non-Technical Summary, while full details of the proposed development are included in Chapter 3.

Table 1.3 Structure of EIAR		
Chapter 1	Introduction and Methodology	Sets out the purpose, legislative requirements and scoping process for the document
Chapter 2	Non Technical Summary	Summarizes the key conclusions and recommendations of the EIAR process
Chapter 3	The Development	Sets out the details of the development proposal
Chapter 4	Alternatives Examined	Details all alternatives examined through the various

		process.
Chapter 5	Population and Human Health	Describes the demographic and socioeconomic profile for the receiving environment
Chapter 6	Biodiversity	Describes the existing ecological interest of the site assesses the impacts and mitigates potential significant negative impacts
Chapter 7	Soils, Geology & Water	Describes the receiving environment in terms of soils, geology and water. Examines potential impacts and identifies mitigation.
Chapter 8	Air Quality & Climate	Provides baseline data, identifies potential impacts and recommends appropriate mitigation.
Chapter 9	Noise and Vibration	Provides baseline data, identifies potential impacts and recommends appropriate mitigation.
Chapter 10	Landscape and Visibility	Describes the potential visual impacts of the proposal on the receiving environment and recommends mitigation
Chapter 11	Material Assets	Deals specifically with traffic impact assessment
Chapter 12	Cultural Heritage	Details the findings of an archaeological Impact assessment
Chapter 13	Interaction with the forgoing	Describes how the above influencing factors interact to inform and shape the final development proposal.
Chapter 14	Summary of Mitigation Measures	Provides a summary of all mitigation works required

Appendices relevant to each chapter are located at the end of each chapter for ease of reference. This format was adopted in consideration of the fact that this EIAR will be an online publication displayed on a chapter by chapter basis.

1.7 Specified Information & Forecasting Methods

In general, no significant difficulties arose regarding the compilation of information and data necessary to prepare this EIAR. In certain areas such as noise, traffic and demographics, assumptions and projections are necessary. Where required, survey work has been undertaken to complement data that was not readily available from established official sources. All assessments have been prepared in accordance with best practice based on the most relevant and up to date available information.

The methods used in the following chapters of this EIAR to forecast the effects of the proposed development on the environment are tried and tested "best practice" methods employed in each of the relevant fields of expertise. The particular methodologies adopted are detailed in the relevant assessments contained in each chapter and additionally in the technical supporting documentation that make up the full planning application package.

1.8 Statement of Competency

"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". ***Article (33) of Directive 2014/52/EU***

The following professionals were responsible for the various chapters of the EIAR. Additional expertise where required is detailed at the beginning of respective chapters.

Table 1.4 The Design Team

Expert	Company	Aspect of Environment	Qualifications	Summary of Professional Expertise
Mark Kennedy	Reddy Architecture + Urbanism	Architectural Design/Master planning	B.Arch (Hons) Dip.Arch MRIAI Dip PM Dip Arb RIAI Conservation Grade III	Mark is a director based in the Kilkenny office of the practice. He is responsible for projects across a range of sectors that include Master Planning, education, office, residential and retail.
Ian Doyle	Ian Doyle Planning Consultant	EIAR Co-Ordination & Compilation Population and Human Health	BA (HONS) Town & Country Planning. Bachelor of Town Planning (BTP).	Ian obtained an Honours Degree in Town and Country Planning and a Bachelor of Town Planning from the University of the West of England and has over 20 years experience as a Town Planner.
Deborah D'Arcy	Deborah D'Arcy Ecologist	Biodiversity	MSc in Ecological Assessment	MSc in Ecological Assessment and 6 years' experience working in

			B.A. in Natural Sciences and MSc in Environmental Resource Management	ecological consultancy
Arthur Murphy	Arthur Murphy & Co	Soils/Water & Geology	B.E.(Hons) Civil Engineering,University College Dublin M.Eng.Sc. (Hydrology), University College Dublin	Arthur Murphy is a Chartered Civil Engineer with a Masters Degree in Hydrology with over 40 years working in the fields of hydrology, foundation and structural engineering, land development, sewage treatment and environmental engineering
Dr. Avril Challoner	AWN Consulting Engineers	Air Quality/Climate	First Class Honours Degree in Environmental Engineering from National University of Ireland, Galway (2009) PhD in Air Quality from the Trinity College Dublin (2012)	A full member of both the Institute of Air Quality Management and Institution of Environmental Sciences. Avril has been active in the field of air quality and climate for 9 years
Ronan Murphy	AWN Consulting Engineers	Noise and Vibration	BSc Environmental Management (Dublin Insitute of Technology) Diploma in Acoustics and Noise Control (Institute of Acoustics)	Ronan is a corporate member of the Institute of Acoustics (IOA) has been working in the field of Acoustics since 2006. He has a broad knowledge base in the measurement, modelling and assessment of environmental noise for a range of sectors including transport, commercial and industry. Ronan also has extensive experience in building acoustics.
Paul Nolan	A1 Design	Landscape and Visibility	H.N.C. Hort. M.R.H.S	Over 20 years experience working in Landscape Design/ Arboriculture.
Eoin Reynolds	NRB Consulting	Traffic Impact Assessment	Chartered Engineer	Eoin is a Chartered Engineer with over 27

	Engineers			years experience Eoin specialises in the field of Traffic & Transportation and Roads Design, is expert in the use of Traffic Engineering Modelling Software (TRICS, ARCADY, PICADY, LINSIG, TRANSYT and Micro-Simulation Techniques).
Catherine McLoughlin	Stafford McLoughlin Archaeology	Archaeology	BSc(Hons) in Archaeology & Paleoecology	Archaeological consultant with over 20 years experience in the archaeological and heritage sectors.

Chapter 2 Non Technical Summary

One of the fundamental objectives of the EIA process is to ensure that the public are made aware of the environmental implications of any decisions about whether to allow new projects to take place. **" Draft Guidelines on the Information to be Contained in an EIS 2015"**

2.1 The Proposed Development

The proposed development is a housing scheme located in Carcur to the North side of Wexford Town which is bound to the front and rear by the River Slaney and the main Dublin-Wexford rail line respectively. The proposed development represents a unique opportunity for the creation of a new mixed-density residential neighbourhood for Wexford Town. The proposal consists of 413 residential units, two crèche facilities and a single retail unit over four phases of development. The aim is to create an exemplary high-quality residential quarter with landmark buildings to form a gateway at the site as required by the Wexford Town Development Plan.

This peninsular site covers 13.84Ha with a gentle rise in contour levels from 0.00 to 9.5 running from the riverside to the North to the link road to the South. The primary access road crosses the site to form a South to North axis following the proposed link bridge to the North side of the River Slaney. From the West to the East, routes will direct traffic to secondary roads encircling home zones. The urban blocks are designed to create home zones of 20/30 units per zone.

Along the Northern and Eastern boundaries, pedestrian and cycle routes are proposed which will connect to and complement adjoining public open spaces to create a continuous open space/walk from the site to the town centre. The residential units consist of 2 storey detached, semi-detached and terrace housing and apartment blocks of four to six storey's. The housing units are of contemporary design with a simple palette of quality materials consisting of brick render with composite aluminum/timber windows. The proposed development will complement the existing skyline when viewed on approach from the northern side of the River Slaney and, in urban design terms, will define the Northern termination point of the town. The development presents a considered and contemporary solution to extend and enrich Wexford Town while being sensitive to its riverside context.

2.1.2 Proposed Phasing

The Development of the site will occur on a phased basis which may be summarized as follows: The phasing of the development has been considered as part of this EIAR while assessing potential impacts and managing mitigation measures.

Table 2.0 Details of Phasing				
Phase	**Area (m2)**	**Apartments**	**Houses**	**No. of Units**
1	42,904	69	47	116
2	27,680	64	35	99
3	30,448	0	73	73
4	37,368	105	20	125
Total	**138,400**	**238**	**175**	**413**

Figure 2.0 Phasing Plan

2.2 Effects on the Environment

Consideration of the environmental impacts by this EIAR was generally restricted to areas that the scoping process had identified as "Likely" and Significant". The relevant areas were then grouped together and assessed under the following headings:

- Population and Human Health
- Biodiversity
- Soil/Geology/ Water
- Air Quality /Climate
- Noise/Vibration
- Landscape and Visibility
- Material Assets – Traffic and Parking
- Cultural Heritage – Archaeology
- Interaction with the foregoing

Each of the above was considered in detail having regard to both the environment as it currently exists prior to the development (receiving environment), the likely impacts that the development proposal could have, and the potential to reduce said impacts when the development is complete and in operation. It is important to note at this stage that the design and layout of the proposed development was revised and continuously assessed to exclude impacts as they were identified. As a result, the impacts and associated mitigation measures identified in this non-technical summary represent a summary of notable remaining impacts (considered in more detail in the EIAR proper) in addition to the measures employed to reduce their impact to the point where they are not significant. The proposed development will not result in any unacceptable environmental impacts.

2.2.1 Population and Human Health

The impact of the proposed development on population and human health has been addressed in detail in Chapter 5 of this EIAR. The assessment includes a comparative analysis of statistical data from the 2011 and 2016 census for the immediate catchment area defined by the CSO Sapmap as the Wexford Settlement. National and regional statistics are referenced as required. In terms of long term impact, the proposed development will provide much needed housing in Wexford Town in an area already rich with recreational, leisure and amenity facilities. Based on the number of bed spaces proposed, the development has the potential to increase the population within the town boundary by up to 1005 people thus raising population levels to aid in achieving the critical mass required to validate social infrastructure such as schools and third level educational institutions. In terms of short term impact, the development proposal will provide for significant direct and indirect employment opportunities during construction phases. As a result it is anticipated that the proposed development will contribute positively regarding population and human health.

2.2.2 Biodiversity

The potential direct, indirect and cumulative impacts of the development on biodiversity (flora and fauna) are assessed in Chapter 6 of this EIAR. A team of experienced ecologists was commissioned to undertake the ecological field surveys and impact assessment. The impact assessments followed best practice and established guidelines and were informed by desktop research, consultations with the National Parks and Wildlife Service and Inland Fisheries Ireland (IFI), detailed ecological field surveys including habitat survey and mapping, botanical surveys, a detailed otter survey and detailed wintering bird surveys. Impact assessments were also informed by review of other relevant assessments including the noise and site specific flood risk (SSFR) and hydrology assessment. The results of the ecological assessments informed mitigation measures incorporated into the design of the development.

Natura 2000 sites

The development site of 13.84 ha is located along the south bank of the River Slaney estuary in the townland of Park, Wexford and is adjacent to the Slaney River Valley SAC and the Wexford Harbour and Slobs SPA. A Natura Impact Statement has been provided for this development. The potential impact of the proposed development was assessed with regard to the conservation objectives of the Slaney Valley SAC, the Wexford Harbour and Slobs SPA and The Raven SPA for those species and habitats considered potentially at risk from this development.

Potential impacts to the River Slaney SAC primarily relate to potential negative impacts on water quality as a result of construction and potential negative impacts of habitat deterioration and disturbance to otter. Measures are incorporated into the design of the development and mitigation measures will be implemented during construction to avoid significant impacts to the otter or to water quality. Impacts to otter are avoided by retention and protection of the otter habitat with permanent fencing around the boundary of the site, construction of a new freshwater pond to replace an existing pond that will be impacted by the development and additional native hedgerow planting to enhance the vegetation buffer. Sensitive design of the outdoor lighting scheme will avoid excessive illumination of the otter habitat along the shoreline.

The development site does not provide significant habitat for any of the bird species for which the SPAs has been designated. The potential impacts to the Wexford Harbour and Slobs SPA primarily involve potential disturbance impacts to waterbirds using the tidal habitats adjacent to the development site. The assessment of these impacts was informed by detailed bird surveys and review of existing water bird data for the SPA. A comprehensive analysis of disturbance responses, areas of habitat and numbers of bird potentially affected by disturbance was undertaken and presented for a worse-case scenario. Review of relevant research literature of waterbird disturbance responses, impacts, noise thresholds and habituation of birds to noise and activity was used to inform the assessment. Taking the landscape design of the development and mitigation measures into account such as the retention and enhancement of existing vegetation at the boundary of the site and the erection of permanent fencing restricting access to the shoreline it was concluded that any potential displacement or disturbance will be very small and there will be no significant impact to any of the waterbird species for which the SPA was designated, or to any of the other waterbird species that regularly occurs in the area.

Potential cumulative impacts primarily relate to cumulative impacts on disturbance to wintering waterbirds and otters. In combination or cumulative effects of development were assessed with reference to planning applications granted in the vicinity of the development and review of the Wexford Town and Environment Development Plan 2009-2015 (as extended). Significant 'in combination' effects on the Slaney Valley SAC or the Wexford Harbour and Slobs SPA are not anticipated.

The NIS determined that with the implementation of mitigation measures that the proposed development will not have significant direct, indirect or cumulative effects on the integrity of the Slaney River Valley SAC or the Wexford Harbour and Slobs SPA/The Raven SPA.

Other features of biodiversity value

The western boundary of the site is adjacent to oak-ash-hazel which is located within the adjacent Slaney River Valley SAC and Wexford Harbour and Slobs SPA. The south eastern boundary is adjacent to a reed bed also included within the adjacent SAC and SPA boundaries. Shingle and sand shores occur adjacent to the northern and eastern boundary of the proposed development site and may correspond to the Annex I habitat Annual vegetation of drift line (1210) which is not a qualifying interest of the Slaney River Valley SAC but is nonetheless evaluated as international value as an Annex I habitat located within an SAC.

There will be temporary minor disturbance impacts to the tidal mudflats, annual vegetation of drift lines habitat and the reed bed habitat located within the SAC as a result of construction of the surface water drainage pipelines installed to discharge surface water to the subtidal waters of the estuary These minor disturbance impacts are not anticipated to result in a significant negative impact due to the small areas of the habitats affected, the short-term nature of the impact and the capacity of these habitats to recover over a short-term period. .

Elsewhere the boundary of the site is demarcated by treelines, hedgerows and scrub. These boundary habitats have been evaluated as of international value as they lie within the boundary of the SAC and SPA. These boundary habitats will not be significantly negatively impacted by the development.

The majority of the internal area of the site is composed of recolonizing bare ground evaluated as of low local value. There is also a small area of exposed sand and gravel. These habitats have developed in areas of previous quarry pits and recent disturbance and have an associated diverse flora characteristic of early successional habitat. Three uncommon plant species have been recorded on site, common cudweed, pale flax and sharp-leaved fluellen. Common cudweed occurs frequently in the exposed sand and gravel habitat. This plant is listed as vulnerable in the Red list for Vascular Plants in Ireland and the exposed sand and gravel habitat has been evaluated as of high local value. A small pond in the north eastern corner of the site is also evaluated as high local value as it is a component of the otter habitat. The invasive plants Japanese knotweed and three-cornered leek are present on the site.

The site contains suitable habitat for the common lizard and the on site population has been estimated to be of high local value. The invertebrate fauna of the development site is evaluated as likely to be of high local importance (primarily due to the likely presence of a diverse range of bees, butterflies and other species associated with early successional habitats) indicated by the floral diversity on site and the presence of suitable nesting habitat for a range of insect species. All other species including the terrestrial bird population and the bat population and other mammals anticipated to occur on the site were evaluated of low local conservation importance or are deemed of negligible conservation value.

The development will result in the loss of the habitats from the internal area of the site. Pre-mitigation the loss of the exposed sand and gravel habitat will be a significant negative impact at the high local scale. The loss of the recolonizing bare ground will be a significant negative impact at the low local scale. The loss of the other habitats on site is not considered significant. There will be a significant negative impact at the high local scale to common lizard and invertebrates. The impacts to all other species are not considered significant.

Mitigation measures have been incorporated into the design of the development to reduce the impacts to habitats and species on the site. In particular these measures include the creation of sand and gravel embankments to compensate for the loss of the exposed sand and gravel habitat on site which supports the population of common cudweed. Other features have been incorporated into the landscaping plan to provide some suitable resources for the common lizard.

The residual impacts are not considered significant and are not anticipated to have a negative impact on the conservation status of any species associated with the site. With the successful creation of sand and gravel embankments the residual impact to that habitat and common cudweed is anticipated to be not significant. There will be a moderate negative impact at the low local scale due to the loss of the recolonising and bare ground (ED3) habitat that supports a range of common species verse flora in the local context. The loss of the recolonising bare ground habitat is not anticipated to have any significant impact on the conservation status of any of the plant species associated with the habitat. Furthermore the habitat is transitional and the diversity of flora would be likely to change and decrease over time as the site would eventually succeed to woodland in the absence of development.

There is a **residual moderate negative impact at the high local scale to invertebrates** due to the loss of flower-rich habitat and nesting sites. There is a **residual moderate negative impact at the high local scale to the common lizard population** predicted for this site due to the loss of suitable habitat. There is a **slight negative impact at the local scale** on the bat population due to loss of some foraging area on site.

Biodiversity enhancement features have been incorporated into the design of the development in particular the new freshwater pond will provide a better resource for otters and will also provide a resource for common frogs which currently have limited resources if any on the development site. This will have a positive effect at the local scale. Enhancement of the hedgerow habitat retained at the boundary of the site with native planting will have a positive effect at the local level. The protection of the replacement sand and gravel habitat (ED1) behind the fence line and vegetation management will ensure the persistence of this habitat and the associated notable plant species into the future and which in the absence of development is subject to disturbance from trail bike riding, camp fires and threatened by scrub encroachment.

Post construction monitoring will be implemented to monitor the otter population and the establishment of vegetation on the new sand and gravel embankments. The site will also be monitored post construction for the occurrence of invasive plant species.

2.2.3 Soil/Geology/ Water

Soil and Geology are discussed in detail in Chapter 7 of this EIAR. A stand alone Hydrological Impact Assessment has been submitted as part of the planning application. So as to keep the EIAR “tightly focused” (as required by the draft 2015 guidelines), only the findings of this assessment are included in this EIAR.

Soils

A considerable amount of soil has already been removed or dislocated as a result of previous sand and gravel extraction on site. It is proposed to import fill from other Wm Neville & Sons Ltd building projects in the vicinity of Wexford town. There is a requirement for between 1 and 3m of fill to be brought on site. All fill materials will be clean inert soil with some rock. The importation of fill from external sources introduces a risk of possible soil contamination on site. The fill importation will comply with relevant environmental and planning regulations in this regard. Industry standard screening and monitoring will be carried out to ensure that non-inert or potentially contaminated material is not placed on site. Full design calculations and phasing for all imported material are included. A berm and 5 temporary siltation ponds shall be employed to prevent any silt or soil entering the estuary. In some places retaining walls are required, on the line of the otter boundary fence, to protect the otter habitat. The sequence of placement of fill, construction of the berms and construction of the otter boundary are set out in Appendix C of the Engineering Report. Engineering Drawings PL 11 and PL 12 give details of this work and its phasing also. The berm shall be removed progressively as the development is completed.

Water

IE Consulting - Carlow Office prepared a Site Specific Flood Risk Assessment (SSFRA) and Hydrological Assessment of Sediment transport for the subject site in respect of the proposed residential development, which should be read in tandem with this EIAR. In consideration of the findings of the SSFRA, and in the context of ‘The Planning System & Flood Risk Management Guidelines – 2009’, areas of the proposed development site fall within Flood Zone ‘A’ and Flood Zone ‘B’.

A detailed Digital Terrain Model (DTM) has been developed for the subject site and surrounding area. Utilising the DTM the results of extreme fluvial and tidal flood events can be predicted over the full extent of the proposed development site. In order to safeguard future development from the effects of fluvial and tidal flood events, it is proposed to raise the existing ground levels within the site area to a minimum level of 2.95m which is equal to the predicted 1 in 1000 year High End Future Scenario tidal flood level in the vicinity of the site. This level of 2.95m is 1m above the 1 in 1000 year tidal flood level.

It is recommended that the finished floor levels of future development are constructed a minimum of 0.3m above the predicted 1 in 1000 year tidal flood level. It is recommended that any existing or proposed surface water pipes or culverts within the site boundary are fitted with appropriately designed tidal flap valves.

In consideration of the predicted flow rate in the River Slaney in the vicinity of the site, the volume of fluvial flood waters that may be displaced by the proposed development is negligible in consideration of the occurrence of an extreme fluvial flood event in the River Slaney. Displacement of these negligible volumes of flood waters from the area of the proposed development site, would simply be attenuated within the vast volume of flood waters within the River Slaney and would have an imperceptible impact on the hydrological regime of the area.

As discussed in Section 9 of the Site Specific Flood Risk Assessment (SSFRA), development of the site is therefore not expected to have an adverse impact on the existing hydro-morphological regime of the Slaney Estuary.

In consideration of the assessment and analysis undertaken as part of the SSFRA, the overall development of the site is not expected to result in an adverse impact to the hydrological regime of the area and is not expected to adversely impact on adjacent lands or properties.

To prevent contaminants entering nearby shellfish waters, all storm water from the site is to be collected from impervious surfaces and infiltrated through a storm water attenuation system prior to discharge to the estuary. There are five attenuation systems proposed within the development site, which have been designed for no flooding up to attenuate the 1 in 100 year rainfall event. The discharge from each of these attenuation systems shall be limited to Greenfield Runoff rates using a flow control device such as a 'Hydrobrake'. The discharge pipes shall be fitted with tidal flaps and shall discharge to the estuary. A study of the potential impact of the surface water run off on the aquaculture of the estuary has been prepared by Aquafact Ltd. And is included as part of the engineering details. This report concludes that the discharge to the estuary will have no impact on aquaculture.

The foul sewage from the development is to be pumped to the Wexford town and environs sewage system. Drinking water for the development is to be provided from the Wexford town public water supply and a supply main has already been installed with the agreement of Wexford County Council along the access road to the proposed railway bridge site.

Possible Gas Migration from Carcur Landfill Site.

A landfill site was operated at Carcur south of the railway and largely east of the proposed development site during the mid-twentieth century. The landfill was closed in 1985 (33 years ago). The closest edge of waste placement in the landfill is 130 metres from the nearest proposed housing within the subject development. The development is separated from the landfill by the railway line and by tidal marshes on each side of the railway. This level of separation and the fine and waterlogged nature of the silts in the tidal zone almost certainly prevent gas from the landfill from reaching any dwellings associated with the proposed development.

Wexford County Council is monitoring the gas levels within the landfill site. As part of the preparation of the subject planning application 2 gas monitoring wells have been installed by the developer within the development site adjacent to the landfill to determine whether there is any migration of gases under the railway and the intervening mudflats. An initial set of readings indicated the presence of low levels of methane. These levels are almost certainly background levels rather than indicating migration from the landfill site. Nevertheless, it is proposed to continue monitoring the gas levels before, during and after construction to ensure that this conclusion is valid and that there is no unforeseen risk to the development.

The results from further monitoring will determine whether there is a need to take specific measures to protect housing within the development and the nature and extent of any measures that may be advisable. This approach has been agreed with Wexford County Council.

The Dept. of Environments 'Protection of New Buildings and Occupants from Landfill Gas', published in 1999 recommends that sites within 250m of landfill sites that were used within the last 30 years should be assessed for landfill gas. The Carcur landfill was closed in 1985, 33 years ago, and before any houses are occupied further time will have elapsed. Subject to further monitoring, potential remedial works will be agreed in full with the Council prior to commencement of development.

2.2.4 Air Quality /Climate

Air Quality and Climate are discussed in detail in Chapter 8 of this EIAR which contains an Air Quality & Climate Assessment. In the long term once development is complete, fugitive emissions of dust from the site will be insignificant and pose no nuisance at nearby receptors. Construction related impacts are potentially significant and as such require mitigation. The mitigation measures for dust are designed with a number of layers of protocol, therefore if one fails in the short-term it should be eliminated by the next. Construction dust monitoring will be put in place to ensure that, should mitigation measures fail and construction dust impacts occur, they will be short term in nature. Mitigation measures include:

- Sweeping and watering of roads to remove mud and aggregate materials from their surface and keep dust down during dry periods.
- A wheel wash facility will be in operation prior to entering onto public roads.
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly.
- Vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered at all times to restrict the escape of dust.
- Public roads outside the site will be regularly inspected for cleanliness, and cleaned as necessary.

Due to the size and nature of the construction activities with appropriate mitigation measures, CO_2 and N_2O emissions during construction will have a negligible impact on climate. The results of an air dispersion modeling study carried out as part of this EIAR indicate that the residual impacts of the proposed development on air quality and climate are predicted to be imperceptible with respect to the operational phase local air quality assessment, for the long and short term.

2.2.5 Noise/Vibration

Potential impacts regarding Noise & Vibration are discussed in detail in Chapter 9 of this EIAR which contains a Noise and Vibration Impact Assessment Report. The main operational impacts regarding noise emanate from traffic associated with the proposed development. A noise survey was undertaken to determine existing levels. Three survey locations were selected to determine the prevailing noise climate in the vicinity of the proposed development. An additional survey location was also required to establish the potential for inward impact from rail noise level on the proposed development.

In addition to road traffic noise, the dominant intermittent noise source was intermittent traffic on the local road access to the GAA grounds. Other sources of intermittent noise included construction noise, birdsong and shouting and voices from the GAA pitch. Railway noise was also recorded with four railway movements over 4 hours during the evening against two over 9 hours during the daytime.

Predicted noise generated during construction will be within recognized standards subject to the following mitigation measures:

- Limiting the hours during which site activities likely to create high levels of noise are permitted.
- Establishing channels of communication between the contractor, local authority and residents.
- Appointing a site representative responsible for matters relating to noise.
- Monitoring typical levels of noise during critical periods and at sensitive locations.
- Furthermore, it is envisaged that a variety of practicable noise control measures will be employed in addition to the maintenance of the propped acoustic screen, including:
- Selection of plant with low inherent potential for generation of noise; and
- Siting of noisy plant as far away from sensitive properties as permitted by site constraints.

With regards to Vibration, it is recommended that a Construction Noise and Vibration Management plan be submitted to Wexford County Council for agreement prior to commencement of development.

The assessment indicates that there may be some potential noise impact from rail operations. In order to reduce the level of rail noise within dwellings proposed along the southern boundary of the site, the following mitigation measures are proposed:

- The boundary wall running along the west of the site will be increased to 3.0m height relative to the finished floor level of the nearest houses and apartments, and;
- Upgraded glazing and ventilation will be incorporated into the design for facades of dwellings incident to the rail line. Glazing offering sound insulation performance of at least 33dB Rw shall be fitted. Additionally through wall or in frame vents shall be selected to offer a sound insulation performance of 35dB Dn,e,w.

2.2.6 Landscape and Visibility

The implications of the proposed development with regards to landscape and visibility are discussed in detail in Chapter 10 of this EIAR which contained a **Visual Impact Assessment**. The proposed development will have limited visual impact on the surrounding landscape. Due to its riverside location, the site is framed to the rear by a rising landscape and as such its impact on the skyline is minimal. The DOE and New County Hall Buildings are located on higher ground to the rear of the site and are of a similar bulk, scale and form. The proposed development is therefore in keeping with the built form in the general vicinity of the site.

The proposed development represents the logical expansion of Wexford town and in urban design terms, will define the Northern termination point of the town when viewed from the northern side of the river. Aspects of the proposal will be instrumental in both defining the entrance experience to the town and creating a sense of place through the provision of visual reference points in the form of landmark buildings.

Both hard and soft landscaping have been utilized to soften the visual impacts of aspects of the development and to “green” the proposed development in general. Particular species have also been employed to prevent access to and protect the Natura site and the Otter habitat and pond. Where possible hard boundaries have been avoided in favor of planted boundaries and only indigenous planning is proposed. Detailed landscaping proposals are included as part of the general planning application.

The visual Impact of the development will be *Moderate* in the short to Medium term, *Slight* in the Long term, - Permanent. Mitigation measures through the preservation of existing vegetation, in the Natura area, in combination with the extensive woodland adjacent to the site, and extensive tree and hedge planting on site, will reduce the visual impact softening the development into the landscape. The choice of material colour and pallet of the building materials will contribute to the blending of the taller buildings into the landscape.

2.2.7 Material Assets – Traffic and Transportation Impacts

Traffic impacts are discussed in detail in Chapter 11 of this EIAR. A road safety audit of the final scheme was also undertaken. The Traffic Impact Assessment has been prepared in accordance with the requirements of The Institution of Highways and Transportation "Guidelines for Traffic Impact Assessment" and the TII's "Traffic & Transport Assessment Guidelines". A Trip Rate Information Computer System (TRICS) was used to predict future traffic generated by the proposed development.

The TTA concludes that the proposed development is not expected to have any adverse impact in terms of traffic capacity or safety on the surrounding road network.

" It has been demonstrated that the construction and operation of the proposed development will have a negligible and un-noticeable impact upon the continued operation of the adjacent road network".

2.2.8 Cultural Heritage – Archaeology

A detailed assessment regarding cultural heritage and the archaeological potential of the site are discussed in detail in Chapter 12 of this EIAR which contains an Archaeological Assessment Report. In addition to a desktop assessment of the site in the context of historic records and other archaeological assessments in the general vicinity of the site, the test trenching took place in January 2016. An inspection of the site and analysis of cartographic and aerial photography sources showed that the site had mostly been quarried and that areas of undisturbed ground were few. However it was possible to select three areas for archaeological testing. These were located close to the water.

The excavation of a series of 20 test trenches at three different locations identified no features of definite archaeological significance. One undated linear feature, C2, was uncovered in Trench 1 within Area 1, otherwise the features in this area consisted of furrows with an accompanying field boundary. Generally, but not always, these features date to the post-medieval period. It is noted that this area is located where open space is proposed and as such the proposed development will have no impact.

Archaeological monitoring is advised under license during construction.

2.2.8 Interaction with the foregoing

Interactions are anticipated between human beings/noise, human beings /dust, human beings/landscape and visibility, flora and fauna/landscape and visibility, and are discussed in detail in Chapter 12 of this EIAR. As previously stated many of the interactions with the foregoing were anticipated at the Master Plan/scoping stage and as such played a key role in influencing the final design.

Chapter 3 The Proposed Development

3.1 Proposed Development

A site of this importance, scale and prominence requires a strategic and plan led approach in the interest of establishing a comprehensive and realistic long-term solution to all potential issues. As such a Masterplan has been prepared by Reddy Architecture + Urbanism for the entire landholding which gives guidance and direction to all future development of the subject lands. The Masterplan identifies the constraints associated with the site particularly regarding the adjacent Natura site, the potential for flooding, and planning policy/transport objectives. The Masterplan sets out parameters and guidance for the overall form of development over the entire site including an overall design concept, open space strategy, the principles governing the road network including the potential future third river crossing and delivery of aspects of the orbital inner relief road and the council's coastal walk objective.

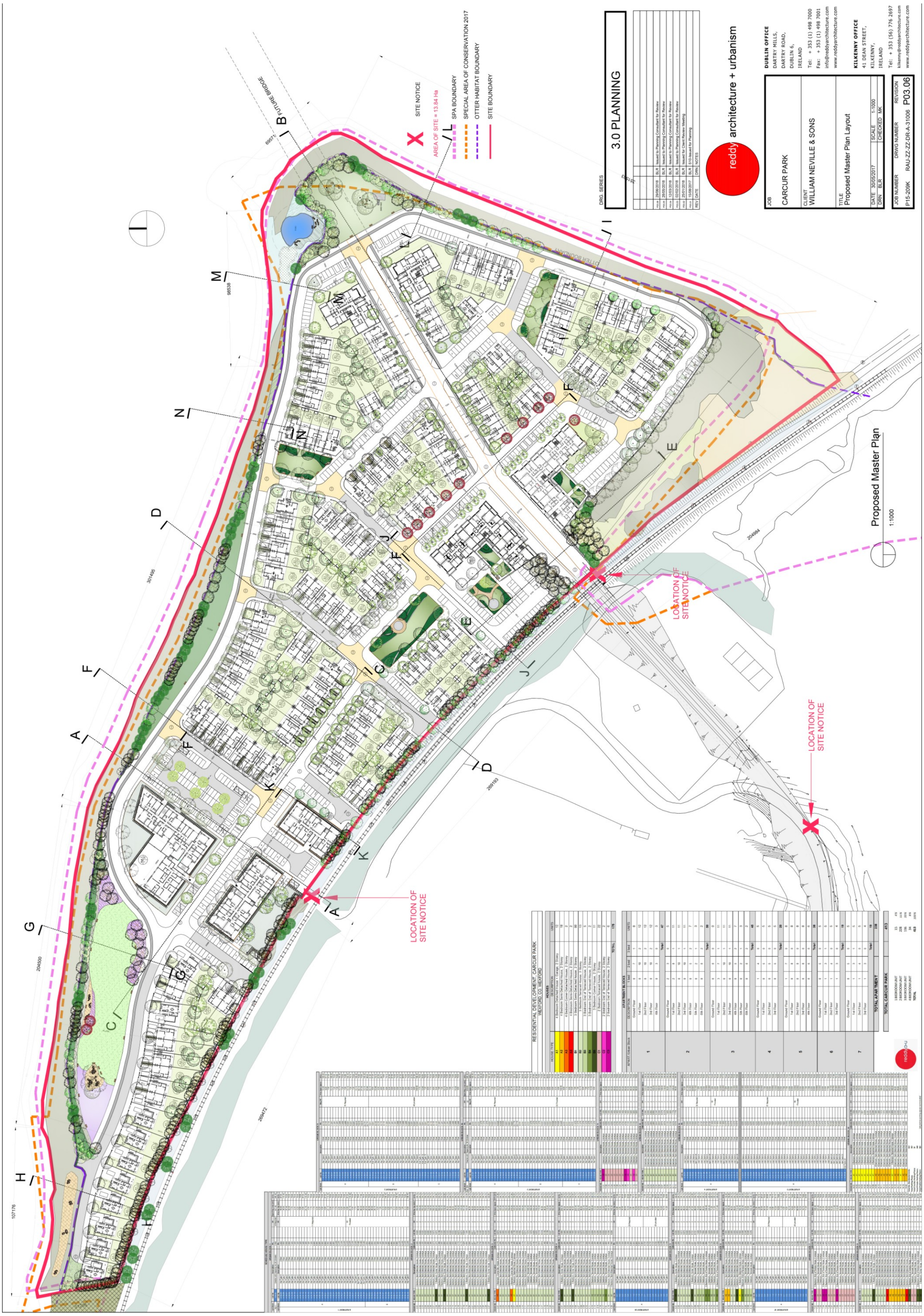
The evolution of the Masterplan is clearly highlighted by the "Design and Access Statement" document prepared by Reddy Architecture + Urbanism which accompanies the subject planning application. The Design and Access Statement should be read in conjunction with this EIAR. A summary of the findings of the Design and Access Statement are included in this EIAR only, in the interest of avoiding duplication.

In general terms, the proposed development consists of 413 residential units over 10 house types and 7 Apartment Blocks including 2 crèche facilities. In addition, a sequence of open spaces in the form of a large linear park along the river edge, a number of formal play areas throughout the site, a wild life corridor/protection zone in the form of an otter pond and incidental planted spaces scattered throughout the development, also form part of the proposal. The design approach has been developed to provide for a gateway experience to and from the town considering the future bridge crossing, through the provision of primary and secondary landmark buildings in addition to a strong mix and range of housing provision in the interest of creating a robust and sustainable community.

Table 3.1 gives a detailed breakdown of the proposed number of units and associated house types. In terms of the planning application, the proposed development is advertised as follows:

Permission is sought by William Neville and Sons for:

"A total of 413 residential units consisting of 175 houses (12 four bedroom detached houses + Garages, 20 four bedroom Semi-Detached houses, 2 four bedroom corner detached houses, 80 three bedroom Semi Detached Houses, 20 three bedroom terraced houses, 7 three bed end of terrace houses, 4 three bedroom corner houses, 20 two bedroom terraced houses, 6 two bedroom end of terrace, 4 Semi-Detached houses), 7 apartment blocks with a total of 238 Apartments: (Block One: (47 units over 5 floors: 40 two bed, 7 three bed), Block Two: (50 units over 7 floors: 4 one bed, 38 two bed, 8 three bed), Block Three: (45 units over 7 floors: 3 one bed, 34 two bed, 8 three bed), Block Four: (20 units over 4 floors: 1 one bed, 19 two bed), Block Five: (38 units over 5 floors: 1 one bed, 37 two bed,) Block Six: (19 units over 4 floors: 3 one bed, 15 two bed, 1 four bed) Block Seven: (19 units over 4 floors: 3 one bed, 15 two bed, 1 four bed)). Together with two crèche facilities (Crèche A: 346.4 sqm floor area. Crèche B 395.3sq.m floor area) and a retail unit of 86.3sq.m (located in Block 10). A total of 769 Car parking spaces (250 private parking spaces, 501 public spaces and 18 creche spaces). and all associated site works". The proposal shall be delivered over four phases of development. An EIAR (Environmental Impact Assessment Report), an NIAR (NATURA Impact Assessment Report) and a SSFRA (Site Specific Flood Risk Assessment have been prepared as part of the planning application)



3.0 PLANNING
DRG. SERIES
reddy architecture + urbanism
DUBLIN OFFICE
KILKENNY OFFICE
JOB
CARCUR PARK
CLIENT
WILLIAM NEVILLE & SONS
TITLE
Proposed Master Plan Layout
P03.06
SITE NOTICE
AREA OF SITE = 13.84 Ha
SPA BOUNDARY
SPECIAL AREA OF CONSERVATION 2017
OTTER HABITAT BOUNDARY
SITE BOUNDARY
FUTURE BRIDGE
Proposed Master Plan
1:1000
LOCATION OF SITE NOTICE
LOCATION OF SITE NOTICE
LOCATION OF SITE NOTICE
RESIDENTIAL DEVELOPMENT, CARCUR PARK

Table 3.1Breakdown of Units Proposed

HOUSES		
HOUSE TYPE	DESCRIPTION	UNITS
A1	4 Bedroom Detached House + Garage, 2 Storey	12
A2	4 Bedroom Semi-Detached House, 2 Storey	18
A3	4 Bedroom Corner Detached House, 2 Storey	2
A4	4 Bedroom Semi-Detached House, 2 Storey	2
B1	3 Bedroom Semi-Detached house, 2 Storey	80
B2	3 Bedroom Terraced House, 2 Storey	13
B3	3 Bedroom End of Terraced House, 2 Storey	5
B4	3 Bedroom End of Terraced House, 2 Storey	2
B5	3 Bedroom Corner House, 2 Storey	11
C1	2 Bedroom Terraced house, 2 Storey	22
C2	2 Bedroom End of Terraced House, 2 Storey	2
C3	2 Bedroom End of Terraced House, 2 Storey	6
	TOTAL	175

APARTMENT BLOCKS					
APART./Urban Block	DESCRIPTION	1 bed	2 bed	3 bed	UNITS
1	Ground Floor	0	7	1	8
	1st Floor	0	10	2	12
	2nd Floor	0	10	2	12
	3rd Floor	0	10	2	12
	4th Floor	0	3	0	3
				Total	47
2	Ground Floor	2	3	0	5
	1st Floor	2	8	1	11
	2nd Floor	0	10	1	11
	3rd Floor	0	10	1	11
	4th Floor	0	5	2	7
	5th Floor	0	2	1	3
	6th Floor	0	0	2	2
				Total	50
3	Ground Floor	0	0	0	0
	1st Floor	3	7	1	11
	2nd Floor	0	10	1	11
	3rd Floor	0	10	1	11
	4th Floor	0	5	2	7
	5th Floor	0	2	1	3
	6th Floor	0	0	2	2
				Total	45
4	Ground Floor	1	4	0	5
	1st Floor	0	5	0	5
	2nd Floor	0	5	0	5
	3rd Floor	0	5	0	5
				Total	20
5	Ground Floor	1	7	0	8
	1st Floor	0	8	0	8
	2nd Floor	0	8	0	8
	3rd Floor	0	8	0	8
	4th Floor	0	6	0	6
				Total	38
6	Ground Floor	0	5	0	5
	1st Floor	1	3	1	5
	2nd Floor	1	4	0	5
	3rd Floor	1	3	0	4
				Total	19
7	Ground Floor	0	5	0	5
	1st Floor	1	3	1	5
	2nd Floor	1	4	0	5
	3rd Floor	1	3	0	4
				Total	19
	TOTAL APARTMENT				238

TYPE	LEVEL	GFA	UNITS	TOTAL GROUND FLOOR (m2)	TOTAL GFA (m2)
A1	GF	66.40	12	796.8	1560
	1ST	63.60			
A2	GF	68.30	18	1229.4	2390.4
	1ST	64.50			
A3	GF	75.80	2	151.6	276
	1ST	62.20			
A4	GF	68.30	2	136.6	265.6
	1ST	64.50			
B1	GF	55.00	80	4400	8384
	1ST	49.80			
B2	GF	64.00	13	832	1561.3
	1ST	56.10			
B3	GF	64.00	5	320	600.5
	1ST	56.10			
B4	GF	50.60	2	101.2	194
	1ST	46.40			
B5	GF	69.50	11	764.5	1348.6
	1ST	53.10			
C1	GF	41.60	22	915.2	1740.2
	1ST	37.50			
C2	GF	41.60	2	83.2	158.2
	1ST	37.50			
C3	GF	41.60	6	249.6	474.6
	1ST	37.50			
TOTAL			175	9980.1	18953.4
APT	UNITS			TOTAL GROUND FLOOR (m2)	TOTAL GFA (m2)
Apt.1	47			1219.30	5190.8
Apt.2	20			1421.90	5872.00
Apt.3	38			1437.30	5882.20
Apt.4	50			454.20	1832.30
Apt.5	45			715.90	3439.50
Apt.6	19			1437.30	4623.30
Apt.7	19			1437.30	4623.30
TOTAL			238	8123.20	31463.40
TOTAL			413	18103.30	50416.80

SITE AREA (m^2)	138400
RESIDENTIAL DENSITY	40DPH
PLOT RATIO	0.51
SITE COVERAGE (m^2)	13.08%
PUBLIC OPEN SPACE (m^2)	39224
SHARED GREEN & BOULEVARD (m^2)	36334

TOTAL CARCUR PARK			413
1 BEDROOM UNIT		15	*4%*
2 BEDROOM UNIT		228	*55%*
3 BEDROOM UNIT		136	*33%*
4 BEDROOM UNIT		34	*8%*
TOTAL		**413**	*100%*

3.2 Site location

The subject site is located in Park, Carcur, which is west of Wexford town centre and located within the Wexford Town boundary. The site is bound to the north by the River Slaney which is a Natura 2000 site, to the southeast by the former Wexford Town Landfill site and to the south west by an extensive established area of playing fields/sports grounds. A railway line runs along the entire southern boundary of the site.

Fig 3.1 Site location

3.3 Site Description

The site is a former quarry and batching plant and as such is described as a “brownfield site”. All quarrying related activity ceased when the current owner purchased the site from Cement Roadstone Holding Ltd.

3.4 Context for the proposed development

The subject site formed part of a wider development area which was subject to an Action Area Plan (AAP) published in 2003 and prepared by Murray O Laoire Architects. The action plan was a joint venture between the then owners of the site Cement Roadstone Holding Ltd. and Wexford County Council and was incorporated and adopted into the Town Development Plan at the time. Many of the site specific objectives of the current Development Plan owe their origins to the key findings of the Murray O Laoire AAP including the zoning of the site, the objective for a third bridge crossing and the objective for the provision of an internal relief road (Objective T8).

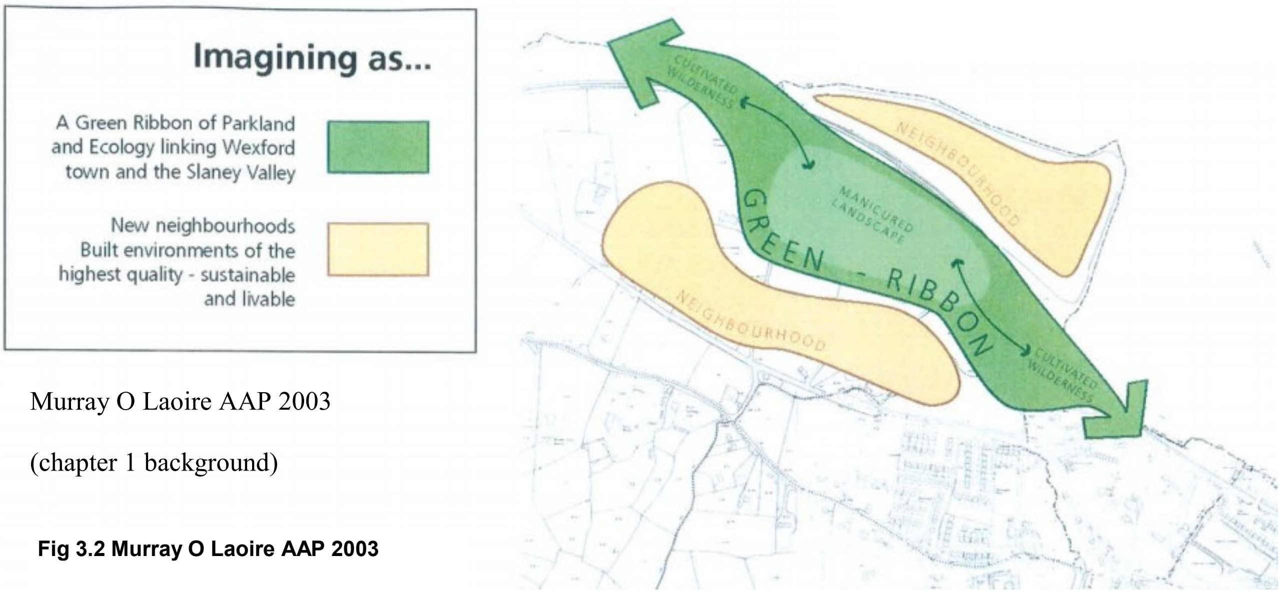
The AAP included the adjoining playing fields to the South West and the former landfill to the Southeast of the site and envisaged upgrading of both to form a regional scale hierarchy of open space provision. The intention was that the remedial works required for the landfill would be tailored to form a town park which together with upgrades to the playing fields/sports/ recreation fields would form a "Green Ribbon" flanked on both sides by residential development.

Cement Roadstone Holding Ltd. paid a significant financial contribution to the council for works required to transition the former dump to a park, as envisaged by the Development Plan and AAP as part of the sale of the subject site to William Neville & Sons. A legal agreement was also drawn up between the Council and William Neville & Sons as part of the sale for the provision of roads infrastructure (Objective T8) and associated bridge over the railway line to provide access to all lands subject to the AAP. Both the railway bridge and the roads infrastructure were approved via Part 8 agreement (copy attached in appendix 3.1).

The infrastructural upgrades have been constructed and are in situ, save for the provision of the bridge over the railway line, and were carried out by the applicant. A financial contribution has been paid for upgrade works to the former landfill for the provision of a park/linear walk (by Cement Roadstone Holding Ltd). The proposed development represents the next step which is the realization of the residential element of the AAP and subsequent Development Plans.

3.5 Planning Context

As stated previously, the first site specific policy document relating to subject lands was undertaken in partnership by Murray O Laoire and Wexford County Council in 2003 prior to the present owner's purchase of the site.



Murray O Laoire AAP 2003

(chapter 1 background)

Fig 3.2 Murray O Laoire AAP 2003

Many of the development objectives pertaining to the site were first established by the Murray O Laoire AAP including the principle of residential development as a complement to a green ribbon incorporating a town park on the site of the former landfill adjacent to the subject site

3.5.1 Development Plan (Wexford Town and Environs Development Plan)

The subject site is located within the Borough boundary of Wexford Town and as such is subject to the requirements of the Wexford Town and Environs Development Plan 2009- 2015 extended). The site is located within "Zone 4" of the Plan. With regards to the site specifically, the plan makes the following statements:

"New public sector quarter is developing with the headquarters for the DOE, New County Hall

and expansion of Wexford Hospital. This will result in the opening of lands for development on adjoining sites which will also deliver a significant proportion of the orbital route linking Newtown Road with Park and eventually to the reserved lands for the third river crossing.

Higher densities will be considered along this route, but new developments must have regard to establishing residential units and along these boundaries a transition density will be required.

Carcur/Park

The lands, former landfill and quarry on the banks of the Slaney, have been the subject of a previous action area plan. The community area could be considered for second level education replacement or a new secondary school could be accommodated. Given the Heritage designation of the inlet the open space/park will be located adjacent to this area.

On The old Quarry Site the opportunity exists to create landmark building at the point of the third river crossing. This site will act as a future gateway to the town. Studies may be required on the third bridge prior to determining the location of these buildings".

In response to the above, it is noted that the DOE building, New County Hall and expansion of Wexford Hospital are all complete, as are significant proportions of the orbital route linking Newtown Road with Park. The development of the subject lands and the realisation of the associated policies and objectives of the development plan represent the next logical progression in terms of the development of Area 4 of the Development Plan.

3.5.2 Site Specific Objectives

The Development Plan includes a number of site specific development objectives all of which have been incorporated into the proposed development.

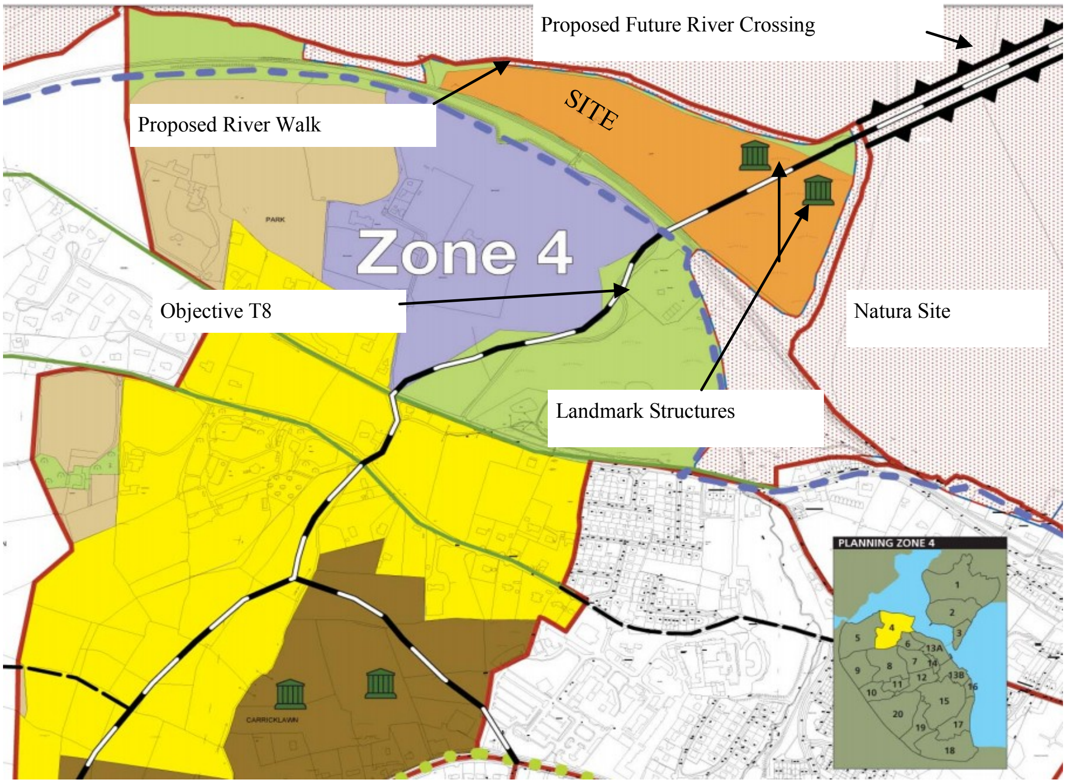


Fig 3.3 Development plan policy

3.5.3 Objective T8 Orbital Inner Relief Road & the Third River Crossing

Objective T8 of the Development Plan relates to the provision of an inner orbital relief road which runs from Sinnottstown lane at the southern extreme of the town boundary in a south-westerly direction until it reaches Clonard. At this point, it changes direction and runs in a north-easterly direction along the rear of Wexford racecourse and on through the subject site to the point where the third river crossing is proposed. Objective T8 terminates on the opposite side of the river. In the context of Area 4 of the Development Plan, Objective T8 has been substantially completed up to the rear boundary of the site.

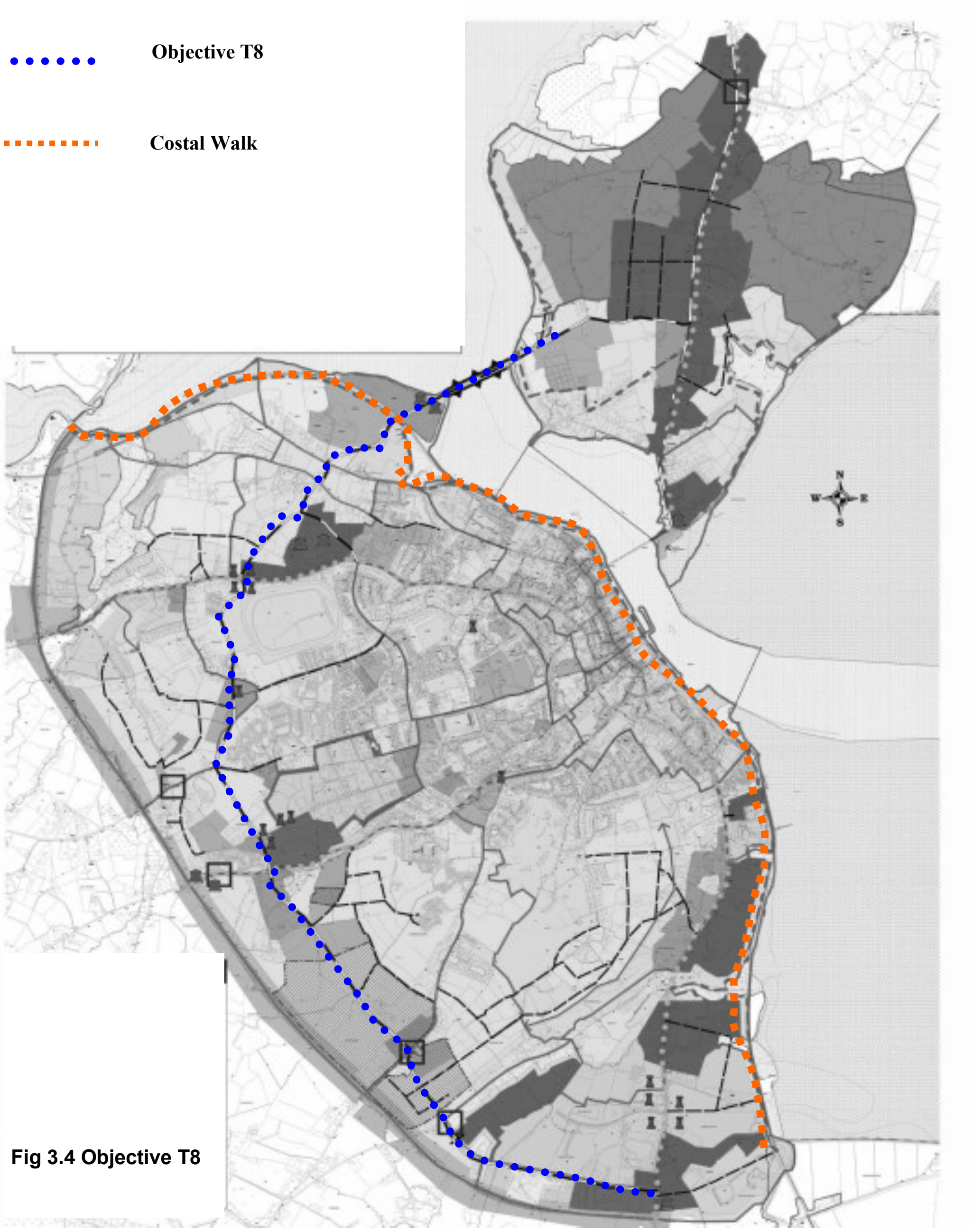


Fig 3.4 Objective T8

The proposed development will further extend the Objective T8 inner relief road to the point where a third river crossing is feasible and viable.

3.5.3.1 Existing Part 8 Approved Railway Crossing

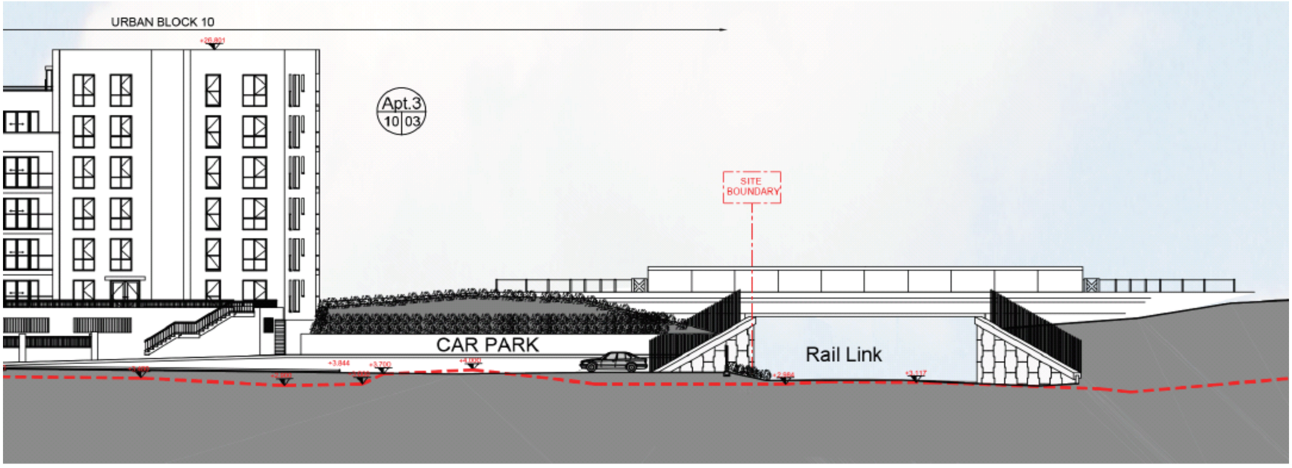


Fig:3.5 Section JJ

Section JJ of the accompanying planning application drawings detail the relationship between the proposed development and the approved bridge over the railway line. As highlighted by the planning application drawings and accompanying engineering drawings, the proposed development has been designed to integrate with the approved bridge. The rail bridge shall be constructed by the developer

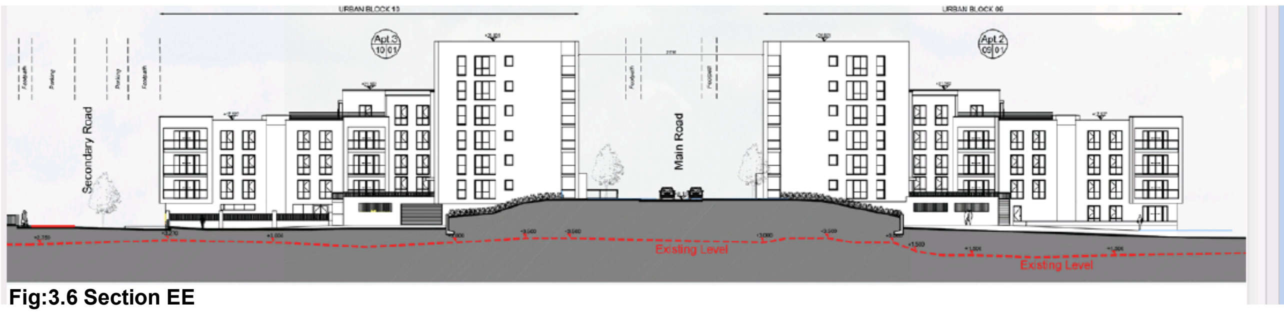


Fig:3.6 Section EE

Section EE of the accompanying planning application drawings highlights the width of the main arterial route through the subject site along the Objective T8 Route. This section demonstrates that there is sufficient reserve to accommodate traffic associated with a future bridge crossing.

The Road Width for streets is defined in DMURS Section 4.4, which states; - "*Lane widths may be increased to 3.5m on arterial and Link Streets where frequent access for larger vehicles is required, there is no median and the total carriageway width does not exceed 7m*." The proposed road at 7.2m wide therefore provides in excess of the minimum width recommended for an Arterial Street and as such is compliant with the requirements of DMURS.

3.5.3.2 Future Third River Crossing

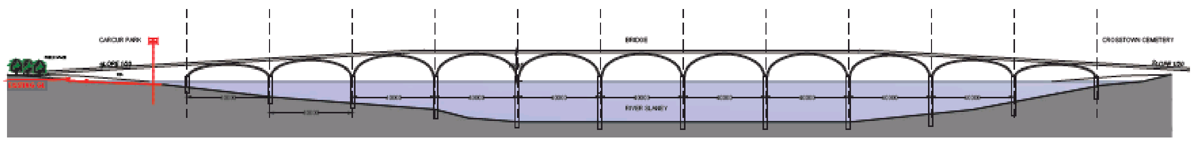


Fig:3.7 Future third river crossing

Sufficient land has also been reserved at the rivers edge to facilitate a bridge with a 1:20 slope of similar construction to that of the Wexford Ferrybank bridge. While the applicant has no control of the lands outside the subject site (edged red), the proposed development has clearly indicated that it facilitates the proposed bridge crossing and integrates with the approved railway bridge.

3.5.4 Coastal Walk

It is an objective of the development plan to provide the following:

- TO2—To ensure the full recreational potential of the River Slaney and its estuary is realised.
- TO3—Provide a pedestrian walkway along the banks of the River Slaney estuary.

PROTECTIVE FENCE SCHEMATIC

While the preservation of habitat associated with wintering birds and the protection of the existing otter population take precedent, proximity to the river will be exploited insofar as is possible.

A linear park with a bird viewing platform form part of the proposal in addition to walkways through the site with views of the river and estuary.

All hard fencing required to protect both the Otter and wintering bird habitats will be suitably screened with planting.

Detailed landscaping proposals are included with the subject application and have been informed by Chapter 6 (Biodiversity) of this EIAR.

3.5.5 Landmark Buildings

It is a site specific objective of the Development Plan to provide a landmark building on site as a gateway to the town. The site will form an important entrance experience to the town once the third river crossing is realised. Landmark buildings at key nodal locations create a sense of place and urban legibility by making locations more readily identifiable. In addition, they add more variance to the urban fabric and act as magnets to public activity.

As part of the proposal, primary and secondary landmark structures are proposed in the form of two large "L" shaped apartment blocks (6 storeys in height) and two smaller scale apartments blocks (three storeys in height) are proposed along the main arterial east west axis.

Fig: 3.8 Landmark Buildings

These buildings will form the main focal point on approach from the proposed third river crossing and will result in a general appearance of "stepping up " in terms of building heights when viewed from a distance. As detailed in Chapter 10 of this EIAR:

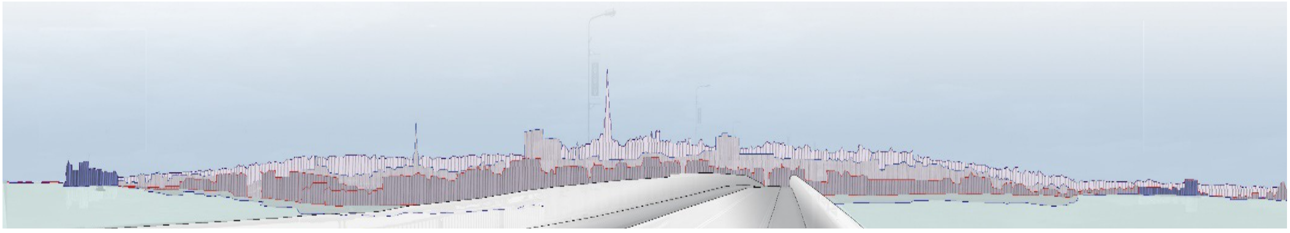
"views directly to the site, are softened by the topography, existing vegetation and backdrop, which help mitigate against visual impact. Distant views will be Slight to Imperceptible and be

Fig: 3.9 DOE and County Hall Buildings

generally neutral in effect"

The taller of the proposed landmark buildings are of a similar bulk, scale and form to that of the recently constructed DOE and Wexford County Hall Buildings located in proximity to the site and will be a complementing addition to the urban landscape.

When viewed on approach from the Ferrybank side of the existing bridge, the proposal and associated landmark structures will complement the existing skyline and define the northern termination point of the town.



3.5.6 Other Relevant Policies (Childcare facilities)

Policy C15 of the Wexford Town and Environs Development Plan states:

"Childcare facilities will be required in all new housing developments at a rate of one childcare facility providing for a minimum 20 childcare places for each 75 residential units and in accordance with the DOELG Planning Guidelines for Childcare Facilities 2001, the Childcare (Pre-School Services) Regulations 1996 and Guidelines for Best Practice in the Design of Childcare Facilities. In appropriate cases the Council will support the provision of these spaces off site provided they serve the inhabitants of the development."

It is proposed to provide crèche facilities on the ground floor of apartment block 2 and block 10. Both crèche facilities are designed to accommodate 30 children and have been designed in accordance with "*Guidelines for Best Practice in the Design of Childcare Facilities*" published by the Department of Children and Youth Affairs. Crèche A will be provided as part of phase 2 while crèche B will be constructed in phase 4.

The high number of Apartment Units throughout the development will result in a reduced demand for Child Care facilities. The number of child spaces required has been calculated by removing the one bed apartments and assuming 50% of the total number of 2 bed apartments and 100% of both the 3 and 4 bed units will generate the need for childcare facilities.

3.5.7 Part V Social affordable housing

Compliance with Part V for the provision of social and affordable housing has been agreed in principle with the Wexford County Council (see Letter of Agreement Appendix 3.0). In accordance with the requirements of part V, units will be offered to the council to purchase. The agreed number of units will be provided on a phased basis, distributed evenly over the proposed four phases.

3.6 Masterplan

As discussed in chapter 4 “Alternatives Examined”, A Masterplan was prepared by Reddy Architecture + Urbanisim. The layout of the scheme evolved over the course of preparing the Masterplan which in turn informed the overall design approach as the various constraints of the site became apparent. The scoping of the EIAR and the evolution of the Masterplan occurred concurrently with the former influencing the latter accordingly.

3.6.1 Site Analysis

A site analysis in the context of both the physical characteristics of the site, the policy requirements of the Development Plan and the scoping process of this EIAR defined the parameters which guided the design approach.

A Natura Protection Boundary (10m set back), and Otter Habitat Protection Boundary were established in addition to land reserve for the provision of the Objective T8 and the third bridge crossing.

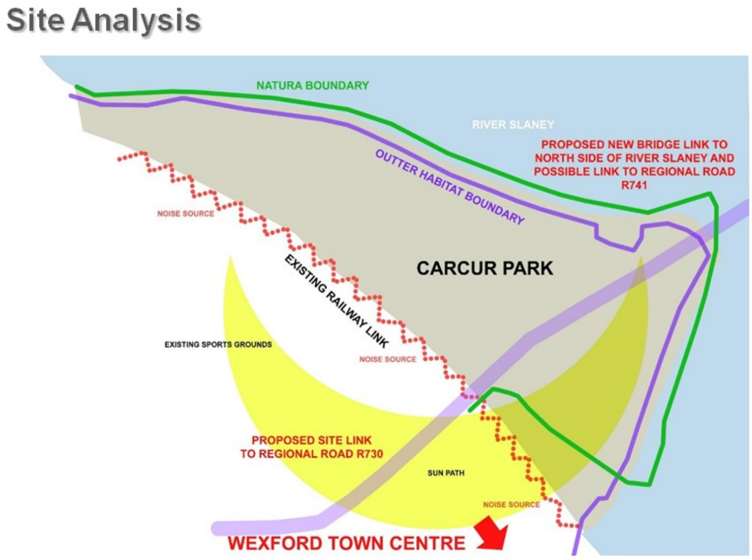


Fig: 3.10 Site Analysis

3.6.2 Open Space

Consideration of the council’s policies **TO2** (*To ensure the full recreational potential of the River Slaney and its estuary is realised)* and **TO3** *(Provide a pedestrian walkway along the banks of the River Slaney estuary)* encouraged the early exploration of the provision of open space along the river edge

Later through the design process further areas of open space were introduced throughout the scheme

Fig: 3.11 Open Space

3.6.3 Transport Routes

The requirement for the provision for objective T8 dictated the main arterial route through the site, in a south-western to north-eastern direction to the point of the proposed river crossing.

In order to unlock the development potential of the rest of the site, a secondary route is required in a south-eastern to north western direction. Tertiary routes provide access to proposed residential blocks.

Fig: 3.12 Transport Routes

3.6.4 Architectural Plan Form

The Architectural form has been developed to provide a natural extension to Wexford town when viewed from the opposite side of the river Slaney. Once the third river crossing is complete this will become an important bookend to the town in terms of a visual urban boundary. The intention is that the development is seen as a continuation of the existing town, providing a contemporary solution which incorporates a mix of designs and forms which are both modern but sympatric to the existing built environment in terms of scale, finish and materials.

Raised platforms and staggered junctions for traffic calming aid in the creation of pedestrian friendly home zones. A sequence of open space provision in the form of both active and passive spaces of varying sizes, together with a large linear park, ensure easy access to open space for all future residents. Dwellings adjacent to open spaces have been designed and orientated with active facades overlooking open spaces as is consistent with best practice regarding natural surveillance.

3.6.5 Landscaping and Habitat Protection

Indigenous landscaping is proposed and detailed landscaping proposals accompany the subject application. Landscaping proposals were developed in close cooperation with the project ecologist. In particular a constructed pond is required to form an active otter habitat post construction. As previously stated the scoping of the EIAR and the associated establishment of ecological constraints were key parameters informing the overall design approach.

Landscaping proposals form a key aspect of protecting the Natura sites during operation phase.

3.6.7 Phasing of Development

The proposed development will be realized over four phases subject to demand. The adopted masterplan approach sets clear parameters for the entire site, while affording flexibility should alterations to future phases be required to cater for changing demands.

Table 3.2 Details of Phasing

Phase	Area (m2)	Apartments	Houses	No. of Units
1	42,904	69	47	116
2	27,680	64	35	99
3	30,448	0	73	73
4	37,368	105	20	125
Total	**138,400**	**238**	**175**	**413**

Phase 1 will include the construction of the bridge over the rail line (which is covered by a Part 8 agreement between the developer and the local authority). This will facilitate the main arterial road into the site fulfilling the requirements of Objective T8 of the Development Plan.

All subsequent phases of development will utilise the new bridge as the main access point to the site. The former quarry entrance will not be utilised for construction traffic.

Fig: 3.13 Phasing of Development

In order to protect the Natura site and associated habitats, a berm and 5 siltation ponds will be employed to prevent siltation or construction material entering the estuary and will be erected along the otter boundary (retaining walls are also proposed see accompanying engineering details drawings PL11 & PL 12) prior to the commencement of construction. The establishment of the otter pond, monitoring and confirmation of its use is also required prior to commencement of construction.

3.6.8 Density

Section 11.08.01 of the Wexford Town & Environs Development Plan outlines the density requirements for zoned lands within the plan area. The plan defines high density development as density provision of more than 27 units per Ha.

In terms of the "Sustainable Residential Development in Urban Areas" Guidelines for Planning Authorities, the site may be considered to be consistent with the definition of Brownfield Site given its previous use:

Fig: 3.14 Density

"any land which has been subjected to building, engineering or other operations, excluding temporary uses or urban green spaces", generally comprise redundant industrial lands or docks but may also include former barracks, hospitals or even occasionally, obsolete housing areas".

However the location of the site relative to Wexford Town Centre is consistent with the guidelines definition of "Outer Suburban" defined as:

"open lands on the periphery of cities or larger towns whose development will require the provision of new infrastructure, roads, sewers and ancillary social and commercial facilities, schools, shops, employment and community facilities".

The net density provision for outer suburban sites as defined by the guidelines is *"in the "general range of 35-50 dwellings per hectare".* The guidelines also state that *"net densities less than 30 dwellings per hectare should generally be discouraged"*

The proposed development has a net density provision of 40 units per Ha which is considered more that the requirements of the Wexford Town & Environs Development Plan and is comfortably within the range recommended by the "Sustainable Residential Development in Urban Areas Guidelines".

Table3.3 Density

Site Area	138,400
Residential Density	40 Units per Ha
Plot Ratio	0.51
Site coverage (sq.m)	13.08%
Public Open Space (sq.m)	39,224
Large Open Space + road (from bridge to rail link)	36,334

Appendix 3.0 Letter of Agreement from Wexford County Council Re: Part V

William Neville & Sons

Rockfield House

Spawell Road

Wexford

02 SEP 2016

Re: Pre –Planning Submission Part V - Carcur

Dear Mr Neville,

I acknowledge receipt of outline detail as to how you propose to meet your Part V obligation in relation to the above site.

I understand that you plan to submit a planning application soon to develop 404 residential units on the site. I wish to confirm that having received confirmation that you plan to meet the Part V obligation by the provision of 37 units. You have also as requested indicated the estimated cost of the units broken down by type.

We will need at a future date to discuss in more detail the costings and the units. However I wish to confirm that Housing Department is satisfied that you have provided sufficient information at this point in relation to Part V to allow you submit planning application for the 24 units.

Yours faithfully

Anthony Bailey

Housing Department

2016 Comhairle na Bliana
2016 Council of the Year
COMMUNITY & COUNCIL AWARDS 2016
IPB INSURANCE AND LAMA

Comhairle Contae Loch Garman
Wexford County Council
An Charraig Leathan, Loch Garman
Carricklawn, Wexford Y35 WY93
053 919 6000 | postmaster@wexfordcoco.ie
www.wexfordcoco.ie | www.twitter.com/wexfordcoco

Appendix 3.1
Part 8 Agreement Wexford County Council and The Applicant

THIS AGREEMENT is dated 23 May 2008

BETWEEN

(1) **CRH Estates Limited** having its registered office at Belgard Castle, Clondalkin, Dublin 22 ~~Saggart, County Dublin~~ (the "Vendor")

AND

(2) **Wexford County Council** of County Hall, Spawell Road, Wexford (the "Council")

(3) **William Neville & Sons** ~~Limited~~ having its registered office at Rockfield House, Spawell Road, Wexford (the "Purchaser")

We certify that the within document has been compared with the original and that same is a true copy thereof.
Signed. Kirwan + Kirwan
Dated. 26-5-08

NOW IT IS AGREED as follows:

1. **Recitals**

1.1 This agreement is supplemental to an agreement dated 25 June 2007 between the Vendor and the Council (the "2007 Agreement"). The parties acknowledge that the "Bridge Agreement" as referred to in the 2007 Agreement has been supplemented by a letter issued by CIE to the Council dated 20 February 2008.

1.2 The Vendor and the Council have agreed that the 2007 Agreement should be supplemented and varied in the manner set out in clause 2 and the 2007 Agreement as varied by this agreement is hereinafter referred to as the "Contract".

1.3 Defined terms and provisions concerning interpretation in the Contract shall apply to this agreement.

1.4 The Purchaser has agreed to purchase the Roadstone Lands and the Vendor wishes to be released and discharged from the Contract. The Council has agreed to release and discharge the Vendor upon the terms of the Purchaser's undertaking to perform the Contract and to be bound by the terms of the Contract in place of the Vendor.

2. **Variation**

The Vendor and the Council agree that the 2007 Agreement shall be varied in the manner following:

2.1 **Council Grant of Easements**

The form of the Council Grant of Easements required to be delivered pursuant to clause 13.1 of the 2007 Agreement is set out in the First Schedule to this agreement in lieu of the form set out in Schedule 4 to the 2007 Agreement.

2.2 **Undertaking re roads and services**

The form of letter of undertaking required to be delivered pursuant to clause 13.2 of the 2007 Agreement is set out in the Second Schedule to this agreement.

2.3 **Wearing course**

(a) The Developer shall not lay the wearing or final course of macadam on the roads comprised in the Works until such time as heavy materials such as fill, blocks, concrete pipes, topsoil and steelwork for the railway bridge have been delivered to the Roadstone Lands and movement of such heavy materials to the Roadstone Lands is complete.

(b) The wearing or final course of macadam on the roads comprised in the Works shall be laid as soon as practicable after the completion of delivery and movement of heavy materials as described in clause 2.3(a) is completed.

(c) The absence of the wearing or final course of macadam on the roads comprised in the Works shall not prevent the issue of the Certificate of Practical Completion, provided that the Council may withhold an amount reasonably certified by the Developer's Engineer as attributable to the cost of laying such wearing or final course of macadam until such works are complete. In the event of a dispute the Independent Engineer shall determine the matter and the provisions of clause 11 shall apply mutatis mutandis.

(d) The Developer and the Council agree that the procedure for the release of the monies withheld pursuant to clause 2.3(c) shall be in accordance with the procedure outlined in clause 11 of the 2007 Agreement

2.4 **Effective Date**

The Purchaser and the Council agree that the Effective Date shall be deemed to have occurred immediately prior to the execution hereof.

3. **Assignment**

The Vendor hereby novates and transfers to the Purchaser all of its rights and obligations under the Contract. References to the Vendor in the Contract shall be read as references to the Purchaser.

4. **Purchaser's undertaking**

The Purchaser undertakes with the Vendor and the Council to perform the Contract and to be bound by the terms of the Contract in every way as if the Purchaser were a party to the Contract in lieu of the Vendor.

5. **Release of Vendor**

The Council releases and discharges the Vendor from all claims and demands whatever in respect of the Contract and accepts the liability of the Purchaser under the Contract in lieu of the liability of the Vendor and agrees to be bound by the terms of the Contract in every way as if the Purchaser were named in the Contract as a party in place of the Vendor.

6. **Failure by the Purchaser to complete**

If the sale of the Roadstone Lands does not complete within three months of the closing date set out in the contract for sale of those lands for any reason other than a breach on the part of the Vendor of its obligations thereunder, the Purchaser shall upon written request from the Vendor execute such further deeds and documents as may be required to re-novate the Development Agreement to the Vendor, and the Council shall at the request of the Vendor execute a deed of novation in substantially the same form as this deed if such deed has been executed by or on behalf of the Vendor and the Purchaser.

IN WITNESS whereof the parties hereto have hereunto caused their respective Common Seals to be hereunto affixed the day and year first herein **WRITTEN**.

First Schedule

Council Grant of Easements

LAND REGISTRY

County Wexford

Folio 1618F
Folio 2331F (Plan 623)
Folio 3582F (part) - D2005TJ010100U
[Additional lands to be acquired from GAA]

THIS GRANT dated 200

BETWEEN

(1) **Wexford County Council** of County Hall, Spawell Road, Wexford (the "Grantor")

AND

(2) ● of ● (the "Grantee").

WITNESSES as follows:

1. **Definitions and interpretation**

In this agreement (save where the context otherwise requires or implies) the following words and expression shall have the following meanings:

"Conduits" means each of the following of whatsoever nature: sewers, drains, pipes, gullies, gutters, ducts, ditches, mains, watercourses, channels, subways, wires, cables, conduits, flues and other conducting media of whatsoever nature or kind;

"Grantee's Lands" means the property comprised in folio WX3581F;

"Grantee" means ● and its successors in title to each and every part of the Grantee's Land and its and their licensees and invitees from time to time;

"Grantor's Lands" means the property coloured pink (now owned by the Grantor) and green (to be acquired by the Grantor) on the map attached hereto comprised in folios ●

"Grantor" means Wexford County Council and its successors in title to each and every part of the Grantor's Land;

"Perpetuity Period" means the period commencing on the date of this Lease and ending on the expiration of twenty-one years from the day of the death of the last survivor of the issue now living of His Late Britannic Majesty King George V;

"Road and Bridge" means the part of the Grantor's Lands that has been or shall within the Perpetuity Period be laid out as a road including the footpaths and kerbs thereof and the bridge the property of the Grantor erected over the railway line separating the

Grantor's Land from the Grantee's Land;

"Utilities" means each of the following of whatsoever nature: water, soil, steam, gas, air, electricity, telephone transmissions, radio transmissions, television transmissions, electronic and optical communications, oil, heating fuels other services servicing the Grantee's Lands;

1. **Grant**

In consideration of EUR10.00 (the receipt of which is hereby acknowledged) the Grantor the registered owner of the Grantor's Lands as beneficial owner **HEREBY GRANTS** to the Grantee and its successors in title and assigns, the owner of the Grantee's Lands and his and their licensees, the easements rights and privileges described in the Schedule hereto.

2. **Assent to registration**

The Grantor hereby assents to the registration of such rights as burdens on the Grantor's Land and consents to the use of the relevant land certificates for that purpose.

3. **Statutory certificates**

3.1 It is hereby further certified that section 29 (conveyance on sale combined with building agreement for dwelling house/apartment) of the Stamp Duties Consolidation Act, 1999, does not apply to this instrument.

3.2 It is hereby certified that the consideration (other than rent) for the sale is wholly attributable to property which is not residential property and that the transaction effected by this instrument does not form part of a larger transaction or of a series of transactions in respect of which the amount or value, or the aggregate amount or value, of the consideration (other than rent) which is not attributable to residential property exceeds EUR10,000.00.

Schedule

1. Full right and liberty in common with all other persons who have or may hereafter have the like right to use the Road and Bridge at all times hereafter by day and by night on foot and with motor vehicles for the purpose of uninterrupted access to and egress from the Grantee's Lands.

2. The free and uninterrupted passage and running of the Utilities from and to the Grantee's Lands through the Conduits which now are or may at any time within the Perpetuity Period be in under or passing through the Grantor's Lands or any part thereof.

3. The right to connect up with and to cleanse inspect repair and renew the Conduits which now are or may at any time within the Perpetuity Period be in under or passing through the Grantor's Lands and within the Perpetuity Period to construct in on or under the Grantor's Lands new Conduits and to cleanse inspect repair and renew the same.

4. For the purposes of exercising the rights granted hereunder to enter upon the Grantor's Lands with workmen and others and all necessary equipment making good any damage thereby occasioned but not being responsible for any temporary inconvenience caused by any such works.

PRESENT when the Common Seal
of **WEXFORD COUNTY COUNCIL**
was affixed hereto:

____

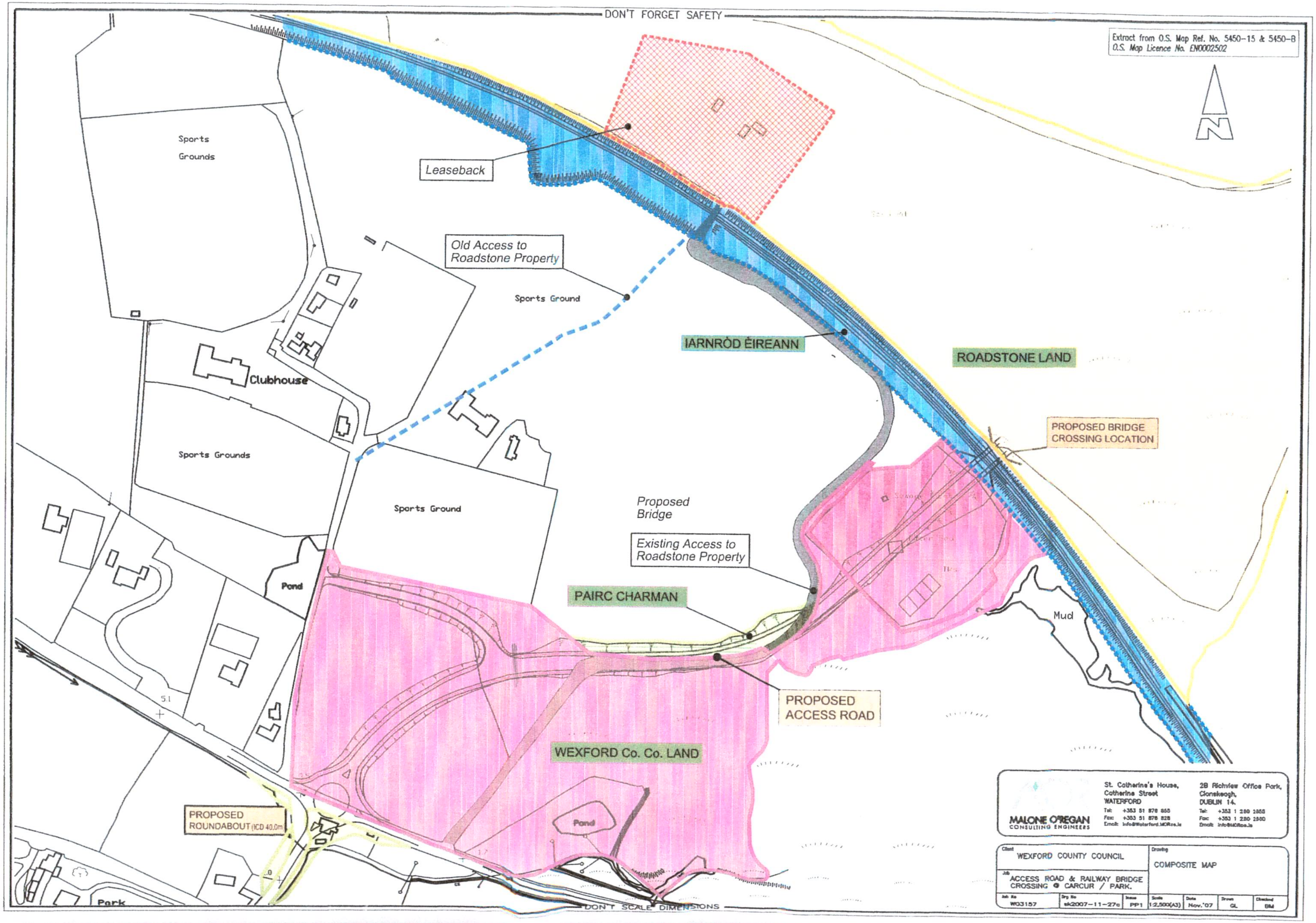
____

PRESENT when the Common Seal
of ●
was affixed hereto:

____
Director

____
Director/Secretary

K.


DON'T FORGET SAFETY
Extract from O.S. Map Ref. No. 5450-15 & 5450-B
O.S. Map Licence No. EN0002502
N
Sports Grounds
Leaseback
Old Access to Roadstone Property
Sports Ground
IARNRÓD ÉIREANN
ROADSTONE LAND
Clubhouse
Sports Grounds
Sports Ground
Proposed Bridge
PROPOSED BRIDGE CROSSING LOCATION
Existing Access to Roadstone Property
Pond
PAIRC CHARMAN
Mud
PROPOSED ACCESS ROAD
51
WEXFORD Co. Co. LAND
Pond
PROPOSED ROUNDABOUT (ICD 40.0m)
Park
DON'T SCALE DIMENSIONS
MALONE O'REGAN
CONSULTING ENGINEERS
St. Catherine's House,
Catherine Street
WATERFORD
Tel: +353 51 878 855
Fax: +353 51 878 828
Email: info@Waterford.MORce.ie
28 Richview Office Park,
Clonskeagh,
DUBLIN 14.
Tel: +353 1 280 2858
Fax: +353 1 280 2900
Email: info@MORce.ie
Client
WEXFORD COUNTY COUNCIL
Drawing
COMPOSITE MAP
Job
ACCESS ROAD & RAILWAY BRIDGE CROSSING @ CARCUR / PARK.
Job No
W03157
Drg No
sk2007-11-27c
Issue
PP1
Scale
1:2,500(A3)
Date
Nov.'07
Drawn
GL
Checked
BM

Second Schedule

Letter of undertaking re roads and services

[Wexford county council headed paper]

To ●

Dear Sirs

Re: Your property at Park –Carcur comprised in Folio WX3581F

In consideration of the construction of a roundabout, access road and bridge and installation of services at Park / Carcur we undertake:

1. To procure that:

   (a) the road, new railway bridge and services (including public lighting) as constructed by you, and

   (b) the old railway bridge at Park –Carcur

   (together the "Roads and Services") are taken in charge on completion thereof in accordance with the Bridge Agreement and the Development Agreement which documents are known and have been identified; and

2. To maintain the Roads and Services until same are taken in charge.

3. To execute contemporaneously with the Deed of Novation of the Development Agreement the Council Grant of Easements as set forth in the Fourth Schedule to the Development Agreement and to hold same in escrow pending completion of works at 1(a) and (b) above in accordance with the Bridge Agreement and the Development Agreement and to hand same over to you at that time.

This letter may be relied upon by you and your successors in title.

Yours faithfully, etc.

PRESENT when the Common Seal of **WILLIAM NEVILLE & SONS ~~LIMITED~~** was affixed hereto:

Director

Director/Secretary

PRESENT when the Common Seal of **CRH ESTATES LIMITED** was affixed hereto:

Director

~~Director~~/Secretary

PRESENT when the Common Seal of **WEXFORD COUNTY COUNCIL** was affixed hereto:

Director of Service

Denis Kennedy
County Councillor

County Secretary

Chapter 4 Alternatives Examined

"The objective is for the developer to present a representative range of practicable alternatives to clearly show how environmental issues were considered at key relevant stages in the design process and how these were balanced against other issues to arrive at the final selected option" Draft Guidelines on the Information to be Contained in an EIS 2015"

4.1 Alternative Locations

The site is zoned for high density mixed use residential development in terms of the Wexford Town and Environs Development Plan and is essential to the delivery of a number of development objectives of key importance to the plan and future development plans going forward. Objective T8 of the current plan requires coordination over many planning applications involving numerous landowners for the delivery of an "Orbital Inner Relief Road" between Wexford Town centre and the "ring road" which forms the Wexford Borough boundary. While sections of the inner relief road have been realized to date, significant sections remain outstanding. As such it is likely that Object T8 will be included in future development plans until such time as the relief road is complete. A strategic component of Objective T8 is the facilitation of a bridge crossing point over the River Slaney which is located on the subject site.

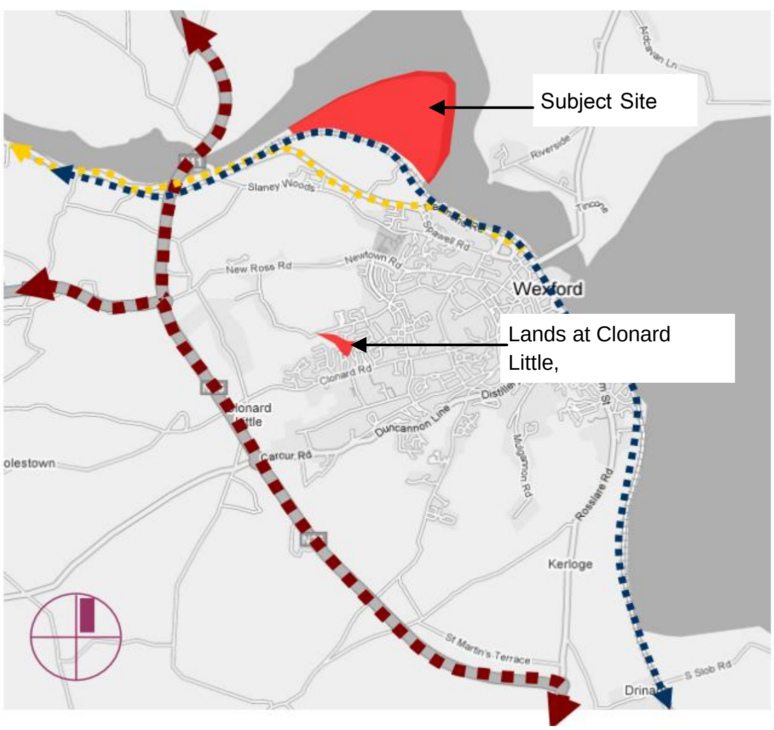


Fig 4.0 Landownership

The proposed development incorporates and facilitates both Objective T8 and the potential crossing point as part of the overall design. The realization of Objective T8 and the bridge crossing point are therefore reliant on the proposed development. Alternative locations were therefore only considered in the context of other lands owned by the applicants within the boundary of Wexford Town. In this regards it is noted that the applicant owns lands in Clonard Little Wexford which is subject to a current planning applicationunder Reg. no. 20170712. The applicants own no other lands within Wexford Town.

4.2 Alternative Layouts

A number of alternative layouts were considered as part of the design process. The layout of the scheme evolved over the course of preparing the Masterplan which in turn informed the overall design approach as the various constraints of the site became apparent. The scoping of the EIAR and the evolution of the Masterplan occurred concurrently with the former influencing the latter accordingly. For example, a requirement for a buffer of ten metres from the high water mark, for the protection of otter Habbitat, in addition to the establishment and protection of the existing otter habitat had a significant influence on the design approach. for the protection of

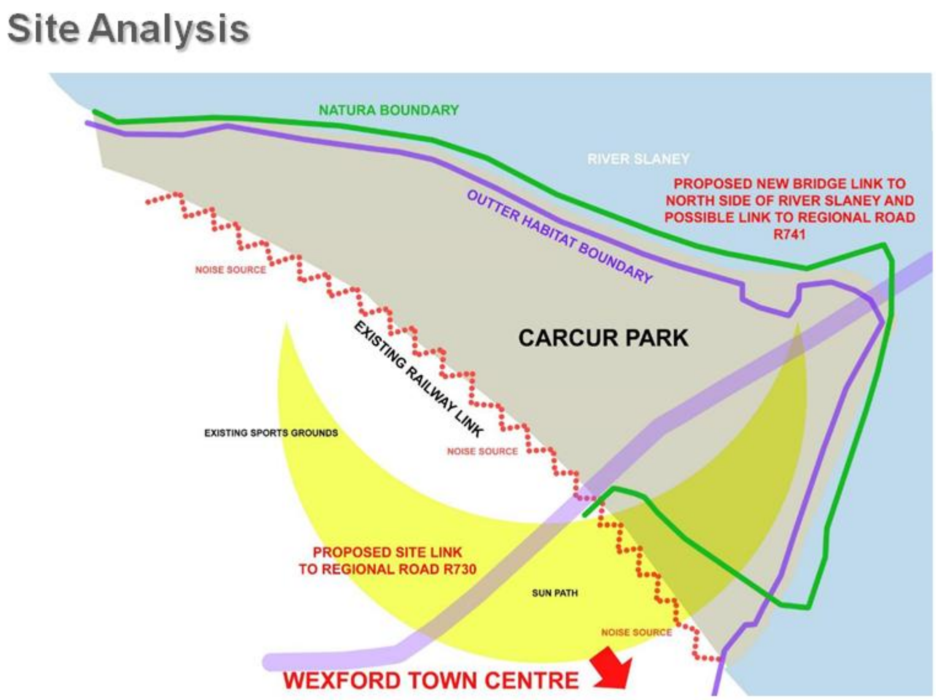


Fig 4.1 Site Analysis

As members of the design team contributed to this EIAR other element of the scheme evolved. For example, the hydrological assessment resulted in raising the level of the site to three metres, the establishment of the need for a hard boundary around the otter habitat informed both the open space provision and the landscaping type, while following a road safety audit alterations were made to the road layout.

4.2.1 Density

Firstly, it must be recognized that the proposed development is a high density development in accordance with the zoning provisions for the site. The zoning requires a density of 27 units per hectare while the scheme proposes an overall density of 40 units per hectare. Density was revised upwards from 28 units per hectare following pre application discussions with An Bord Pleanala and Wexford County Council. (A Section 5 Consultation meeting took place at the offices of Wexford County Council on the 20th of October 2017).

Fig 4.2 High Density

A density study was undertaken to inform the design response. Densities in excess of that required by the development plan were considered as part of the design process. Extreme low density designs were also considered in addition to medium density designs across the entire site.

Fig 4.3 Medium Density

Fig 4.4 Low Density

As an exercise, this approach helped to inform the final layout, which incorporates elements from all three density studies in the interest of providing for a strong mix of unit type and form. This also ensures that the right design response in terms of density, height, bulk and form is matched to the right portion of the site on a micro level. For example, the apartment blocks are placed back from the river edge on the lowest part of the site. Building heights and density are then tapered off in a north westerly direction. This reduces the overall visual impact of the development creating a scheme which is sympathetic to the natural curvature of the receiving landscape. This will also give the impression of stepping up in terms of building heights as an arrival experience when approaching from the future bridge crossing.

Apartments from both the high and medium density scenarios are incorporated into the final scheme as are detached and semidetached house types from the low density scenario. A strong and varied mix of house types is proposed catering for families, single/young couples and the elderly.

4.3 Alternative Designs

As previously stated, the design of the scheme evolved through the EIAR preparation process and the same can be said for the design of buildings, urban form, open space provision and street level considerations such as building heights and fenestration, finishing materials, the preservation and creation of views and vistas, public vs private spaces, incidental, active and passive open space provision, and accessibility. The evolution of the design and associated alternatives considered are described in detail by the Design and Access Statement prepared by Reddy Architecture+ Urbanism which accompanies the subject planning application. As part of the design evolution process a comparative study for similar precedents for scale, density and placemaking was undertaken with specific reference to the cities of Malmo and Dubrovnik.

Fig 4.5 Alternatives examined

The landscaping proposals were redesigned over several drafts to incorporate the ongoing findings of the Natura Impact Assessment and Biodiversity Chapter of this EIAR.

In addition the applicants have many years experience as house builders which also contributed extensively to the design of house types in terms of unit sizes, layouts and finishing materials.

4.4 Alternative Process

No alternative process or approach to how the final development proposal was achieved was considered. The evolution of the scheme through both the scoping of this EIAR and the Masterplan process was considered to be the most appropriate approach. The constraints identified and highlighted by Chapter 6 (Biodiversity) of this EIAR established limited parameters upon which potential development proposals could be formulated.

4.5 Alternative Mitigation Measures

No major alternative mitigation measures were considered as the site characteristics and constraints determined by the EIAR scoping and Masterplan processes limited the extent of potential responses. A number of alternative mitigation measures were considered with regards to boundary treatments around the otter habitat. Trenches, a hard boundary in the form of a wall and fences of varying materials were considered. Similarly, a number of locations were considered for the otter pond before settling on the most appropriate option.

Alternative options were considered with regards to limiting the inward impacts of the rail line and associated noise from passing trains on the proposed dwellings along the rear of the site. Alternative designs and building materials including increased glazing were considered initially however it was determined that the issue could be more appropriately addressed through the use of acoustic barriers and selective planting along the southern shared boundary of the site and railway line.

Alternative mitigation measures were also considered with regards to the method of treating the Japanese knotweed.

Chapter 5 Population and Human Health

5.0 Introduction

This Chapter of the EIAR has been prepared by Ian Doyle Planning Consultant. Ian graduated from the University of the West of England with a BA (Hons) Degree in Town and County Planning and a Bachelor of Town Planning, BTP. Ian has over 20 years experience working across the private and public sectors. One of the main concerns in the development process is that people, as communities or as individuals, should not experience a diminished quality of life as a direct result of the construction and operation of a development proposal. The impacts of a development such as that proposed, must be considered in terms of demographic and employment characteristics, as well as impacts on social infrastructure within the broader context of social sustainability. The integration of the proposed development within the existing social fabric and the ability of existing social infrastructure to accommodate the proposed development are of equal standing.

5.0.1 Methodology

Only preliminary statistical data for the 2016 census was published at the time of preparing this EIAR. For comparative purposes statistics regarding employment, household formation, population age structure and social class have been taken from multiple sources such as:

- *Socio-Economic Statement and High Level Goals* -- Wexford Local Community Development Committee and the Economic Development and Enterprise Strategic Policy Committee, 2015.

- *Wexford County Development Plan and Wexford Town & Environs Development Plan* -- Wexford County Council.

- *Winning Foreign Direct Investment 2015-2019* – Industrial Development Authority.

- *Current Irish Emigration and Return* -- University College Cork, 2013;

- *National Statement of Housing Supply and Demand 2016 and Outlook for 2017-18* -- Housing Agency;

- Various newspaper articles published by the Irish Times;

- Statistical data taken from the AIRO Census Mapping Module.

5.1 Receiving Environment

5.1.1 The Southeast Region

County Wexford forms part of the “South East Region” of Ireland together with Carlow, Kilkenny, South Tipperary and Waterford. The results of Census 2011 indicated that the population of County Wexford had grown to 145,320 persons from the previous census in 2006. This represented an increase of 13,571 persons and signified the highest growth rate, 10.3%, in the South-East Region at that time, against the state average of 8.1%. The state growth rate has more than halved over that of the previous census clearly as a result of the decline of the national economy over that period.

As demonstrated by table 5.1 below, the preliminary census 2016 results indicate a population increase of 4,285 people, in percentage terms a 2.9% increase, for County Wexford for the period 2011 to 2016. This represents the third highest increase in the region after Carlow and Kilkenny which recorded population growths of 4.1% and 3.9% respectively. The national average was 3.7% for that period. Regionally, South Tipperary experienced the least growth with a minimal population increase of 0.7%. Three of the five Southeastern Regional Counties experienced growth rates below the state average.

Table 5.1 Population, Actual and Percentage Change 2011 to 2016 For Southeast Region

	Population - 2011	Population - 2016	Actual change 2011-2016 (Number)	Percentage change 2011-2016 (%)
State	4,588,252	4,757,976	169,724	3.7
Leinster	2,504,814	2,630,720	125,906	5
Carlow	54,612	56,875	2,263	4.1
Kilkenny	95,419	99,118	3,699	3.9
Wexford	145,320	149,605	4,285	2.9
South Tipperary	88,432	89,071	639	0.7
Waterford	113,795	116,401	2,606	2.3

Figures in the above table for 2016 are preliminary figures only.

5.1.2 Natural Increase

In the period 2006 to 2011, County Wexford experienced the highest rates of natural increase and net migration in the South-East Region. Over half of the net migration to the South-East Region was concentrated in County Wexford and 48.3% of the increase in population in County Wexford (6,544 persons) was due to net inward migration.

Over the period of 2011-2016 Wexford recorded a minus figure of -1,311 persons in terms of net migration which is the highest loss in the region. While Carlow, South Tipperary, Wexford, and

Waterford all experienced decline in terms of net migration, Kilkenny experienced a growth of 127 persons.

5.1.3 Wexford

Wexford is the largest town in the County. Alterations to the boundary of the functional area of Wexford Borough in 2008 resulted in a significant increase in its population, with a population of 19,913 persons recorded in Census 2011. As indicated by Table 5.2 below, preliminary results for Census 2016 indicate that this figure has increased marginally to 20,167, which is an increase of 254 people or 1.3%. Table 5.2 includes figures for both urban and rural areas. A comparison of urban and rural population trends can often indicate housing need relative to settlement patterns.

In the period 2006 to 2011 three of the County's main urban areas experienced population decline. Enniscorthy Town decreased from 3241 persons to 2842 persons (-12.3%), New Ross Town decreased from 4677 persons to 4552 persons (-2.7%) and Gorey Urban ED had a slight decrease from 3479 persons to 3470 persons (-0.3%). With the exception of New Ross Town which experienced a decrease of 3.1% (-140 persons), all of the main towns in County Wexford experienced a population increase between 2011 and 2016. Enniscorthy Town experienced the highest rate of growth at 9.3% (263 people), Gorey Urban ED grew by 1.2 % (42 people) and as previously stated Wexford grew by 254 people or 1.3%.

Table 5.2 Population and Actual and Percentage Change 2011 to 2016 by Census Year, Electoral Division by Town, Urban and Rural

	Population – 2011	Population - 2016	Actual change 2011-2016	Percentage change 2011-2016 (%)
State	4588252	4757976	169724	3.7
Leinster	2504814	2630720	125906	5
Wexford County	145320	149605	4285	2.9
Wexford Urban	19913	20167	254	1.3
Wexford Rural Area	29592	30160	568	1.9
Gorey Urban	3463	3505	42	1.2
Gorey Rural Area	30676	32902	2226	7.3
Enniscorthy Town	2842	3105	263	9.3
Enniscorthy Rural Area	37374	38373	999	2.7
New Ross Town	4533	4393	-140	-3.1
New Ross Rural Area	20390	20505	115	0.6

Figures in the above table for 2016 are preliminary figures only.

While the decline of urban areas highlighted by the 2011 statistics has been reversed, generally speaking, the Rural Areas of County Wexford experienced significantly higher growth rates than the urban areas in actual population terms over the period 2011 -2016. Gorey Rural Area experienced the highest growth rate of 7.3% which equates to an actual increase of 2,226 people. Enniscorthy Rural Area increased by 999 people (2.7%), Wexford Rural Area grew by 568 persons (1.9%) and New Ross Rural Area grew by 115 people (0.6%).

Nationally, urban populations increased by 5% while rural areas increased by 2%. Enniscorthy Town recorded an anomalous 9.3% increase, (in actual terms this equates to a minor population increase of just 263 people) while Gorey Rural recorded a significant increase of 7.3%. Wexford Borough recorded well below average increases while New Ross town recorded a loss of population. In simple terms the rural population of County Wexford is increasing above national average levels while, with the exception of Gorey, the urban areas are stagnant, experiencing marginal increases or are in decline.

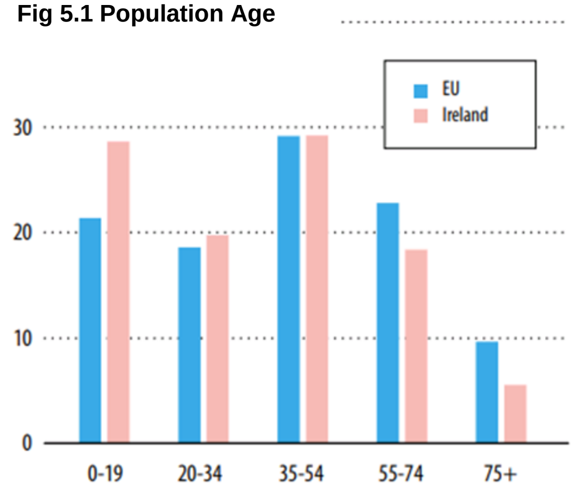
Combining the Rural and Urban figures by area as highlighted by Table 5.3, gives a clearer indication of growth across Wexford's four main settlements.

Table 5.3 Actual Population Change by Area 2011-2016

	Wexford	**Enniscorthy**	**Gorey**	**New Ross**
Urban	254	263	42	-140
Rural	568	999	2226	115
Total	**822**	**1262**	**2268**	**-25**

Gorey and North County Wexford in general appears to be growing at a rate of more than that of the rest of the County combined with an overall increase of 2,268 people or 53 % of the overall growth for the County. Enniscorthy accounts for 28.5% or 1,263 people, Wexford accounts for 19% or 822 people while New Ross accounts for -0.5% of growth or minus -25 people.

Fig 5.1 Population Age



Source: European Commission (2016) Population and Labour Force Projections 2016-2046

5.2 Population Age Structure

When compared to other countries in Western Europe, Ireland has a relatively young population. As is evident from Figure 5.1, Ireland has a higher proportion of younger people (individuals aged 19 years old or less) compared to the rest of the EU. Approximately 28% of the population in Ireland is under the age of 19, compared to an average of 21% across the EU. The extent of people in the 20- 34 age group and those between 35-55 years old is marginally higher in Ireland when compared to the EU average age profile.

Between 2006 and 2011 the population within the 65 plus age bracket in Wexford increased by 19.9% (+3,043 people). This was the highest rate of increase in the South-East region, the 5th highest nationally and represented 12.6% of the total population living in the county. The significant increase in population recorded in the north of the County for 2016 as highlighted above would suggest that holiday homes are becoming permanent places of residence for retirees further increasing the population in this age bracket. This increase will result in further significant demand for elderly services within the County and it is predicted that the population within this age cohort will increase to approximately 22% of the total population within the county by in 2031 (CSO). Approximately 55,000 more people in Ireland are forecast to be over 75 years of age by 2021, a 20.9% increase on the approximately 260,900 people currently in this age group. The CSO forecast that the number of people aged 55 years or older will be the fastest growing age group by 2021. A growing trend towards care in the community would suggest that this age group should be catered for via one and two bed dwellings. Over 50% of the proposed total number of residential units proposed as part of this scheme consists of 1-2 bed units.

5.2.1 Wexford Settlement Area

To determine the potential effects of the development on the immediate receiving environment, statistical data from the "Wexford Settlement Area" as defined by the CSO Sapmap (Map 5.1) have been employed for 2011 and 2016 for the purposes of comparative analysis. A full breakdown of all the CSO Sapmap statistics for 2011 and 2016 used for this assessment are included in Appendix 5.1.

Table 5.4 compares figures recorded in 2016 with those recorded in 2011 in terms of population by age for the Wexford Settlement as defined by the CSO Sapmap. Actual change is also recorded.

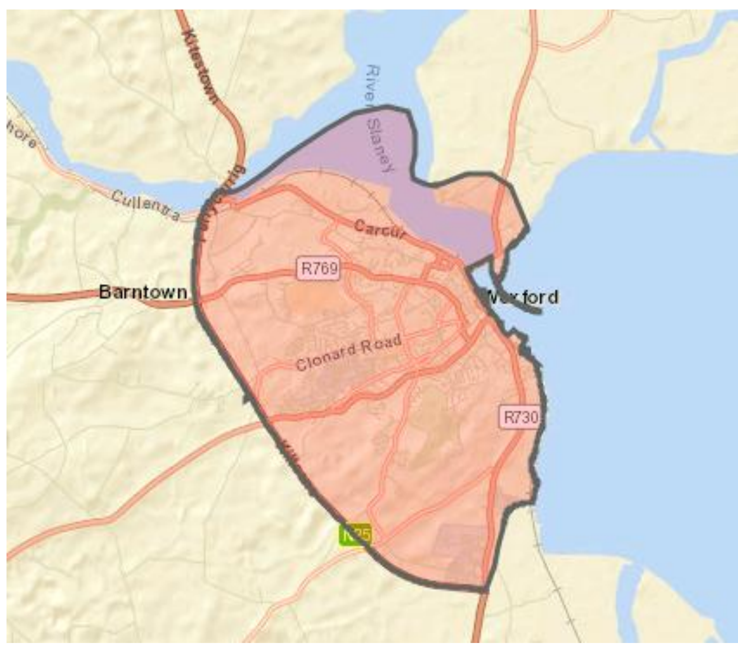


Fig 5.2 Census Sapmap Area: Settlements Wexford

Table 5.4 Population Age Structure 2011 and 2016 Actual Change Wexford Settlement			
Age Group	**Total 2011**	**Total 2016**	**Difference**
0	299	242	-57
1	293	266	-27
2	299	265	-34
3	259	250	9
4	241	283	42
5	241	289	48
6	221	243	22
7	260	292	32
8	239	247	8
9	238	244	6
10	262	238	-24
11	254	222	-33
12	245	264	19
13	237	217	-20
14	237	223	-14
15	216	262	46
16	248	232	-16
17	250	240	-10
18	245	262	17
19	230	195	-35
20-24	1139	1,025	-114
25-29	1720	1,324	-396
30-34	1836	1,650	-186
35-39	1458	1,672	219
40-44	1338	1,397	59
45-49	1331	1,291	40
50-54	1229	1,309	80
55-59	1096	1,184	88
60-64	1028	1,065	37
65-69	869	1,013	144
70-74	793	810	17
75-79	581	669	88
80-84	370	444	74
85+	270	359	89
Total	20,072	20,188	116

Fig 5.2 Census Sapmap Area: Settlements Wexford

In 2011 County Wexford recorded higher than state average population levels within the 0-4, 5-9 and 10 – 14 age groups. Increasing levels in the young age cohorts is a positive sign and suggests a new demographic vibrancy for large parts of the county over the coming years. Five years on however and this trend has stabilized. Nationally, numbers in the 0-4 age profile fell by 7% while County Wexford experienced a 10.5% decrease. Within the Wexford Settlement Area a 42% decrease in numbers in this age cohort was recorded. This suggests that young families are moving outside the settlement area and significant reductions in the numbers within the 20-34 age groups would appear to support this.

Nationally in the 5-12 cohort an increase of 8.8% was recorded between 2011 and 2016. Wexford County registered a below average 5.2% while an increase of 4% was recorded for the Wexford Settlement Area. Within the 13-18 year old cohort the national average increase was 7.7%. While County Wexford experienced an 8.7% increase, Wexford Settlement remained stagnant with an increase of just 3 persons.

While the population of young adults aged 19-24 experienced a fall of 6.5% nationally, County Wexford experienced a fall of 7.3%. A fall of 11% was recorded for the Wexford Settlement. The adult population (25-64) experienced growth of 4.4% on average for cities and towns over 10,000 people between 2011 and 2016. Wexford Borough experienced a decrease of 0.5%. The state average increase of people aged 65 or older from 2011 to 2016 was 19.1%. While Wexford County was generally consistent with the state average at 19.7% Wexford Settlement recorded a below average increase of 12%.

Table 5.6 Persons of all ages and Sex, Aggregate Town Size and Census Area Wexford Settlement Area

Year	2011	2016	% Change
State	4,588,252	4,757,976	3.7
Towns 10,000 + population	716,381	763,396	6.5
Wexford Settlement	20,072	20,188	0.5

Table 5.6 compares growth in overall population for the State, for other towns with a population in excess of 10,000 and the Wexford Settlement Area between 2011 and 2016. It is clear that the Wexford Settlement area has not experienced growth in line with national averages.

5.3 Housing Stock

The 2016 census recorded a total housing stock for County Wexford of 68,206, of which vacant households (excluding holiday homes) accounted for 5,918. Nationally, the results show that the number of occupied households increased by just over 49,000, while the number of vacant dwellings (excl. holiday homes) fell by 31,698. The number of holiday homes increased marginally by 1,809. Table 5.6 details private households by type of accommodation for 2011 and 2016 for the Wexford Settlement Area. While an overall increase of 50 residential units was recorded, this is not entirely accurate as a result of the total number of households recorded as “not stated”.

Table 5.6 Private households by type of accommodation Census Area Wexford Settlement Area				
	2016		2011	
Type of accommodation	**Households**	**Persons**	**Households**	**Persons**
House/Bungalow	7,002	17,656	7021	17,775
Flat/Apartment	917	1,523	789	1226
Bed-sit	9	13	16	20
Caravan/Mobile Home	4	4	2	2
Not stated	98	236	152	350
Total	8,030	19,432	7980	19356

Removing the “not stated” and “caravan/mobile” figures shows an overall increase of 103 units (a reduction of 18 Houses/Bungalows, an increase of Flats/Apartments by 128, a decrease in the number of Bed-sits of 7 units).

5.3.1 *Rental Sector*

Daft.ie publishes quarterly statistics on changes in rents based on traffic through its webpage which advertises houses to rent across the country. Nationally, there were 20% fewer homes to rent in 2016 compared to 2011. The national average increase in rents is 10% per quarter since 2006 (despite a cap of 4%) and now stands at an all time high of €1,261 per month.

Wexford experienced a countywide annual percentage increase of 7.8 % in the period 2015-16 with average rents at €647 per month. The cost of renting a 2 bed house is up 9.9% for the same period at €529 per month while the cost of a 4 bed to rent is up 8.1% to €696.

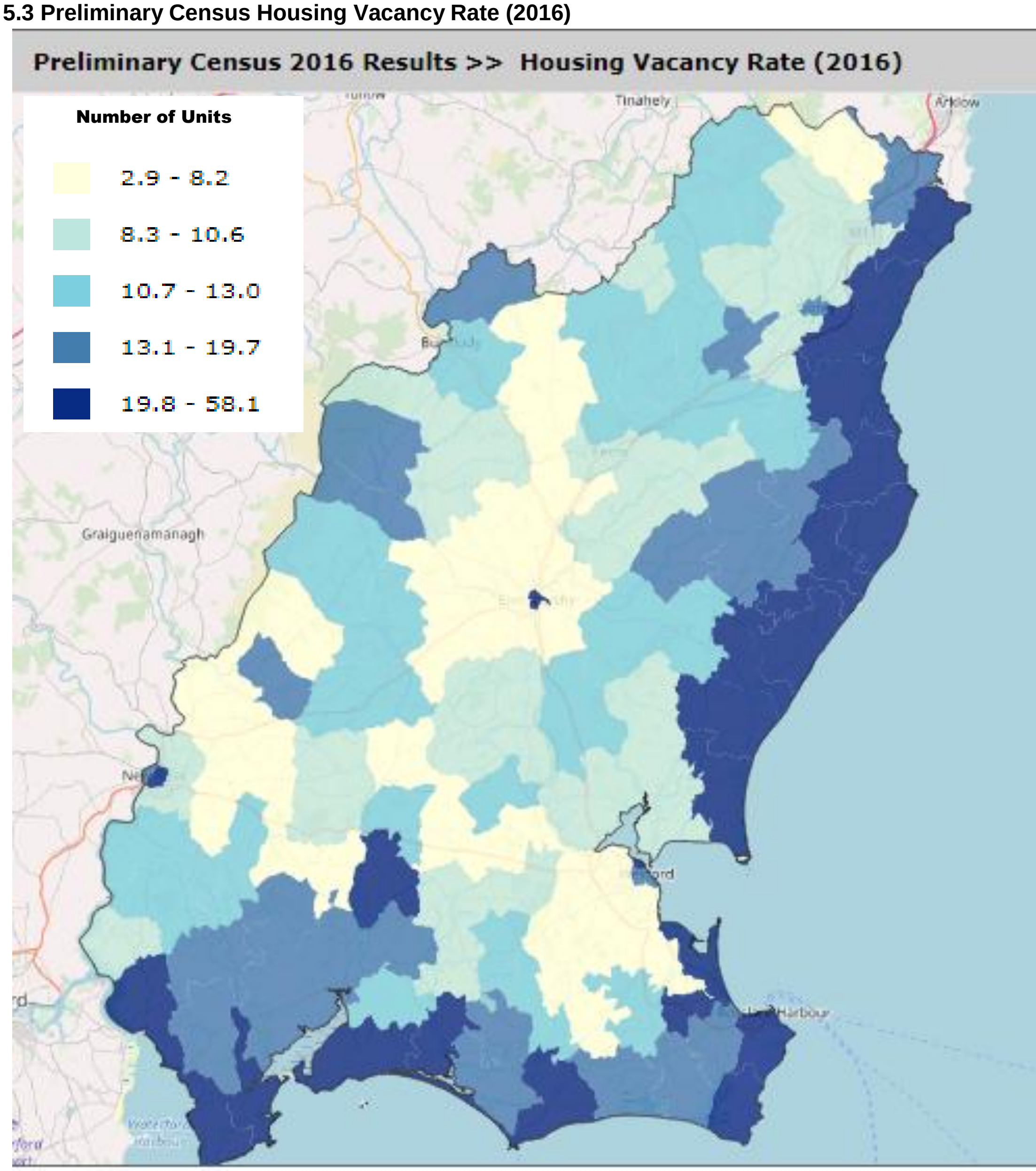
Telephone interviews with local estate agents and property management companies conducted as part of this report highlights significant differences in rental rates across the county. Rents in Wexford Town achieve an average of €900 per month for a three and four bedroom house while rents in New Ross and Enniscorthy are €650 to €700 per month for a similar property.

Supply is at an all time low particularly in Wexford town where it is not uncommon to have 10 families looking to view and rent a single advertised property. Generally speaking, properties are slow to come to the rental market with most tenants choosing to stay in a property as long as possible and usually accepting rent increases annually in excess of national averages.

5.3.2 Vacancy Rates

Since 2006 the census has provided information on the number of vacant dwellings in Ireland and the results showed there were 266,322 vacant dwellings (incl. holiday homes) in Ireland at that time which accounted for 15% of the national housing stock. By 2011 the number of vacant dwellings had increased by 23,129 to 289,451while the overall vacancy rate (14.4%) had fallen. The 2016 census results show that the number of vacant dwellings has fallen nationally by 29,889 (-13.8%) and now stands at 259,562 (12%). Within this the number of holiday homes has increased marginally between 2011 and 2016, from 59,395 to 61,204.

Fig. 5.3 Preliminary Census Housing Vacancy Rate (2016)



County Wexford registered a percentage change of -15% in terms of vacancy rates. However, when you consider vacant dwellings as a percentage of total available housing stock, Wexford has a rate of 19% compared to the national average of 13%. Wexford County has the 8th highest rate nationally in this regards. When you examine the figures for percentage vacancy rates (of housing stock) by electoral division, a clear pattern emerges. The highest level of vacancy rates occurs along the east and south of the county where there is a direct correlation with the provision of holiday homes. It is possible to conclude therefore that the higher than average vacancy rates in County Wexford can be attributed to a higher than average provision of Holiday homes and is concentrated outside of the main urban centres. Vacancy rates in excess of 25% are recorded outside of towns and villages in the open countryside from Curacloe to the north of the County in Tara Hill.

Within the Wexford Settlement Area, the 2016 census recorded a total of 1,167 vacant dwellings compared to 1,496 recorded in 2011. This equates to a reduction in vacant dwellings of 22% or 329 residential units.

5.4 Employment

In April 2016, there were 69,237 persons in the labour force in County Wexford, an increase of 1,760 people or 2.6% on 2011. The labour force participation rate in County Wexford recorded by the 2016 census was 59.3%, compared to the state figure of 61.4 %. Wexford has the second highest proportion of the labor market nationally classified to class 6 - Unskilled, at 4.8% (Monaghan is the highest at 5.1).

In County Wexford 8,200 people are classed as professional workers while 38,100 are classed as managerial and technical. 27,200 workers are classed as non manual while 24.900 are classed as skilled manual. 19,000 are classed as semi skilled and 7,200 are classed as unskilled. 25,200 workers are classed as “other gainfully occupations” and unknown”. In Census 2016, 15.1% of Wexford's population indicated that they had a disability which was higher than the national average of 13.5%.

5.4.1 Agriculture

Wexford has a long tradition in agriculture with its ‘Model County’ name earned from the county’s progressive farming methods and its model farms. The agricultural sector was considered to be strong. In 2011, 8.4% of the workforce were employed in agriculture, forestry and fishing which was significantly higher than the State average of 5.1%. The overall employment profile for the county is quite different from the State. It is characterized by a higher than average dependence on employment in the traditional lower end sectors of agriculture and low level manufacturing.

5.4.2 Foreign direct Investment (FDI)

A total of 12,081 people were employed by FDI companies in the South East Region in 2014. There are 10 FDI companies located in Wexford which from a regional perspective compares favorably with Waterford (12), Wicklow (10), Tipperary (10), Carlow (6) and Kilkenny (3). This is set to increase with the IDA proposing increased investment of 40% for the South East Region over the coming years.

Existing FDI companies are involved in five sectors: Medical Technology (3), ICT Hardware (1), Consumer Products (1), Consumer Goods (1) and Bio Pharmaceuticals (1), all of which offer sustainable jobs for a skilled workforce. Employment in FDI companies has shown no signs of decline and highlights the sustainability of this sector. However, there may be an over reliance on the sector particularly in Wexford town.

5.4.3 Micro Enterprise

Available figures from the 2011 census show that a total of 91.3% of all enterprises in Wexford employ less than 10 people and as such are classified as micro-enterprises. This is broadly in line with the State average of 90.7% and the South-East Regional average of 91.6%. Employment in micro-enterprises accounts for 30.9% of all employment in the county which is significantly higher than the State average of 20.3%. The high level of micro enterprises-led employment in the county highlights the entrepreneurial nature of the business sector in Wexford. The County has the 8th highest rate of entrepreneurial activity in the State. This leaves it susceptible to sharp increases in unemployment during periods of economic decline.

5.4.4 Tourism

Wexford is the 5th most popular destination in the country for domestic tourists and the 5th highest domestic tourism earner in the State. In 2013, a total of €107m was spent by domestic tourists in Wexford. The number of overseas visitors to Wexford has increased significantly in recent years with numbers increasing by 27% between 2009 and 2013. In 2013, a total of 229,000 overseas visitors came to Wexford which represented 29% of the total visitors to the South-East region. Wexford generated the highest level of overseas tourism revenue than the other counties in the region with €60m of the total revenue €203m generated in the region. In 2011, 6.9% of the county’s total workforce was employed in the tourism sector which is higher than the State average of 5.7%. Wexford has the 8th highest rate of employment in this sector in the country.

5.5 Unemployment

While nationally the average rate of unemployment fell by 6.1 % since 2011, (from 19.0% to 12.9%), unemployment in County Wexford remains significantly higher than the state average. Wexford recorded the 5th highest unemployment rate in Ireland according to the 2016 census which is an improvement on the previous census. An unemployment rate of 16.6% was recorded compared to the state average of 12.9 %.(Longford has the highest unemployment rate national of 19.6% followed by Donegal, Carlow, Louth and Wexford). With 24% of the total labour force unemployed in 2011, County Wexford had the 3rd highest rate of unemployment in Ireland with only Longford and Donegal with higher rates.

In actual terms an unemployment rate of 16.6% equates to a total of 11,478 people. There are four unemployment blackspots in the County: Wexford town had an average unemployment rate of 31.1%, Enniscorthy Urban 32.1%, Rosbercon 30.8%, and Killincooly, Kilmuckridge 27.2%.

5.6 Education

Figures published in 2015 by the Economic Development and Enterprise Strategic Policy Committee highlight that County Wexford has a very high rate of early school leavers. A total of 18.5% of those who have completed their education have no Formal/Primary education while 20.7% have a Lower Secondary education. These rates are significantly higher than the State averages of 15.2% and 16.6% respectively. In contrast, Wexford has the third lowest rate of third level education in the country with only 20.9% of those who have completed education having third level qualifications. This is well below the State average of 29.1% and was flagged as being of major concern in 2015 by the Economic Development and Enterprise Strategic Policy Committee which stated that “The lack of 3rd level institutions in the County is a key educational weakness”.

Institutions such as Waterford and Carlow IT continue to develop Outreach programs in Wexford Town. However, the lack of local options results in the loss of a significant proportion of the young adult population (18-24) to the county. Research published by the ERSI and published by the Irish Times (03/012/2015) show that take-up of third level education from Wexford school leavers is high at 75%.

According to Census 2016 In County Wexford the number of students aged 15 years and over accounted for 11,045, an increase of 7.2% per cent from 2011. Nationally, the number of students aged 15 and over increased by 4.5% to 427,128 over the five years.

5.6.1 Investment in Education

Under the “Program for Capital Investment in Schools” for the period 2016-2021 Wexford Town has recently seen significant investment in Secondary level education facilities. Developments such as the new Loreto Convent post primary school which is due to open in 2018 and a new building at the CBS Secondary school have seen significant investment in modern facilities with expanded pupil numbers**.** Further new build facilities for the Wexford Educate Together primary school are also proposed over the plan period in addition to new primary and secondary facilities in Gorey and Enniscorthy.

5.7 Emigration

According to Garda Vetting Data for working abroad, an average of 1,000 persons have been leaving County Wexford per year over the period 2008-2016. A study undertaken by University College Cork in 2013 entitled ‘Current Irish EMIGration and REturn’ determined that the vast majority of people who left Ireland in the preceding years following the economic slowdown were young with approximately 86% of emigrants aged between 15 and 44. The vast majority, over 70%, of emigrants were aged in their twenties when they departed. Over 15% of emigrants are aged in their thirties, with approximately twice as many aged in their early thirties (30-34) than their later thirties (35-39).

To put this in the context of Wexford, the 2016 census shows a sharp decline in the total number of people within the 20 – 35 year age brackets. Figures from the 2011 census showed that within the 20 to 35 age cohorts Wexford had marked lower rates than that of the state, as indicated by Table 5.4 above

5.8 Households and Social Class

In 2013, the private rented sector in Wexford accounted for 14.5% of households (an increase of 122%, or 4,181 since 2006). Wexford had the highest rate of rent supplement payments per 1,000 private rented households in the State over the same period which highlights a very high dependence on State support for housing. The numbers in receipt of rent supplement for more than 18 months and who are classed as having a long term housing need accounted for 63% of all those receiving rent supplement payments.

An article published in May 2014 by the Irish Times indicated that a total of 3,176 people were on the housing list in County Wexford. This figure represented an increase of 52% from the previous year. The state average was 42 %, prompting the Social Justice campaigner Fr Peter McVerry to warn of a potential “tsunami of homelessness” across the state. There is little evidence to suggest that this situation has changed.

With over a third (33.5%) of all households in Wexford built post 2001, it is likely that a high proportion of owner occupier households in the county are in negative equity. In addition, the average house price in Wexford decreased by 57% between 2006 and 2013. This rate of decrease is considerably higher than the state average of 49%. The 2011 census recorded that Wexford town had a high percentage, (88%) of owner occupiers. Census 2016 recorded an owner occupier rate of 59.6% for the Wexford Settlement (as defined by the CSO Sapmap) A fall in the number of owner occupied households is consistent with national trends as the number of owner occupied households fell between 2011 and 2016 (from 1,149,924 to 1,147,552). The overall home ownership rate dropped from 69.7 per cent to 67.6 per cent.

5.9 Characteristics of the Proposed Development

The proposed development is primarily a residential development with crèche facilities to accommodate the potential design population, and a neighbourhood shop of under 100sq.m to provide for “top up” or “neighbourhood” service to the local population only. The proposal will involve the development of a variety of residential units including houses, duplexes and apartments to cater for a mixed demographic population.

During the construction phase, the main site activities will include extensive site clearance and fill involving the importation of materials to raise site levels across the site prior to the construction of the proposed buildings. Approximately 60 people will be directly employed during the construction phase.

During the operational phase of the development, there will be a population potential of 1,005 persons based on proposed bed spaces. Both of the two crèche facilities are designed to accommodate 30 children.

5.10 Potential Impacts of the Proposed Development

As previously stated the site is a suburban brownfield site located approximately 2km from Wexford Town centre. The immediate adjacent lands are recreational/leisure, or reserved for the provision of open space/public amenities. Beyond these lands are undeveloped residential zoned lands and a number of completed housing developments. The area is serviced by recently completed road improvements which were carried out by the applicant on behalf of the County Council.

The general area may be described as being in transition, consisting of serviced zoned lands with all necessary infrastructures in place to accommodate development.

5.10.1 Construction Phase

The proposed development is unlikely to give rise to impact on the surrounding settlement during the construction phase, due to the sites location. The nearest dwellings are located between 200 and 500 metres from the development site. Chapter 9 of this EIAR states that subject to standard construction practices that construction related activity is unlikely to cause disturbance. A Construction Management Plan will be agreed in full with the planning authority prior to commencement of development.

The proposed development will give rise to some temporary impact and disturbance locally during the construction phase to users of the adjacent playing fields. In particular an element of noise will ensue, due to mobility of heavy vehicles, and the arrival and departure of construction workers into the area. This disruption will be for a limited period of time and it is noted that peak use of the playing fields is generally outside of standard working hours late evenings and weekends.

The impact is rated as moderate, negative and short term.

5.10.2 Operational Phase

Once the development has been constructed and is fully occupied, the most significant impact will be population increase. As has been demonstrated above, the population increase of the Wexford Settlement Area over the last census period was significantly behind the national average for urban areas and in real terms is considered stagnant. This, coupled with an overall increase in the population of rural Wexford, would suggest a prevalence of unsustainable movement from urban to rural particularly by young families. This appears to be supported by the fact that the total number of residential units in the Wexford Settlement Area decreased between 2011 and 2016. The proposed development, in which 3 and 4 bed units constitute 41% of total units constructed, will afford young families the opportunity to stay within the settlement boundary and contribute to reversing current unsustainable settlement patterns.

The proposed development has a population potential of 1,005 persons based on proposed bed spaces. This will go a long way towards rebalancing the population of Wexford Urban/Rural in line with national expectations. It is recognized that Ireland is currently experiencing a housing crisis with supply incapable of meeting demand. The availability of new housing stock as a result of the proposed development will potentially address this at a local level, and may take the pressure off the rental sector through increased supply.

Sharp rises in rents over short periods of time that have occurred in Wexford Town, indicate a lack of available rental properties, suggesting a strong need for additional housing. As new housing is complete, increase in supply will result in a reduction in rents. Higher than average reliance on state-provided housing in Wexford indicates a strong need for social affordable housing. The applicant has committed to meeting all social housing obligations under Part V of the Planning and Development Regulations. Social housing will be provided across all phases of development in full agreement with Wexford County Council.

Increasing the population within Wexford Town will contribute to the critical mass required to justify provision of a third level educational facility and/or additional outreach services from Carlow and Waterford ITs. Increased population will also contribute to securing viability of local public transport and other social infrastructure.

In terms of community gain, the development offers both long and short term benefits. In the short term the development will provide two modern crèche facilities and fulfill Council objectives for the provision of a walk/cycle way from Wexford Quay in the town centre to Ferrycarrig, including a "Hide" for observing wildlife associated with the river. In the long term the development affords the potential to deliver key transport objectives of the Development Plan including the point of the proposed second bridge crossing and sections of the associated inner relief road (Objective T8).

5.11 Do Nothing Scenario

A do nothing scenario would result in the subject lands remaining undeveloped and the potential for the delivery of key objectives of the Town and Environs Development Plan would go unrealized. Specifically, the delivery of the future third river crossing and the completion of the inner orbital relief road (Objective T8) are reliant on the subject development.

From a sustainable planning and development perspective a do nothing scenario would be considered as an under-utilisation of zoned and serviced brownfield suburban lands.

A do-nothing scenario would result in a continual decline of the population of the Wexford settlement area and encourage unsustainable development of greenfield lands more remote from the town centre.

A failure to deliver the proposed residential units would have implications regarding achieving critical mass in terms of population requirements to sustain or establish services like public transport, education and social and commercial facilities.

5.12 Mitigation Measures

During the construction and operational phases a number of mitigating measures should be considered. Most are covered elsewhere within this EIAR specifically with regards to noise and dust abatement measures. Working hours should consider the peak use of adjacent playing fields and should be agreed with the council in full as part of the construction management plan.

The development has been designed in four self contained phases with balanced provision in terms of house design and unit type. Crèche facilities are provided as part of phase 2 to cater for phases 1 and 2 and phase 4 to cater for phases 3 and 4. Social affordable housing is also distributed evenly across phases of development.

With regards to construction traffic, the phasing of the scheme has been designed to avoid scenarios where construction traffic associated with future phases of development will have to pass through completed phases of development. This has been achieved through the use of two site entrances. Following completion and occupation of phase one a dedicated construction traffic entrance will be provided to reduce the potential for conflict with residential traffic. A construction traffic management strategy will be agreed in full with the Local Authority as part of the Construction Management Plan.

5.13 Monitoring

In relation to the impact of the development on population and human health it is considered that monitoring measures are not required.

5.14 Conclusion

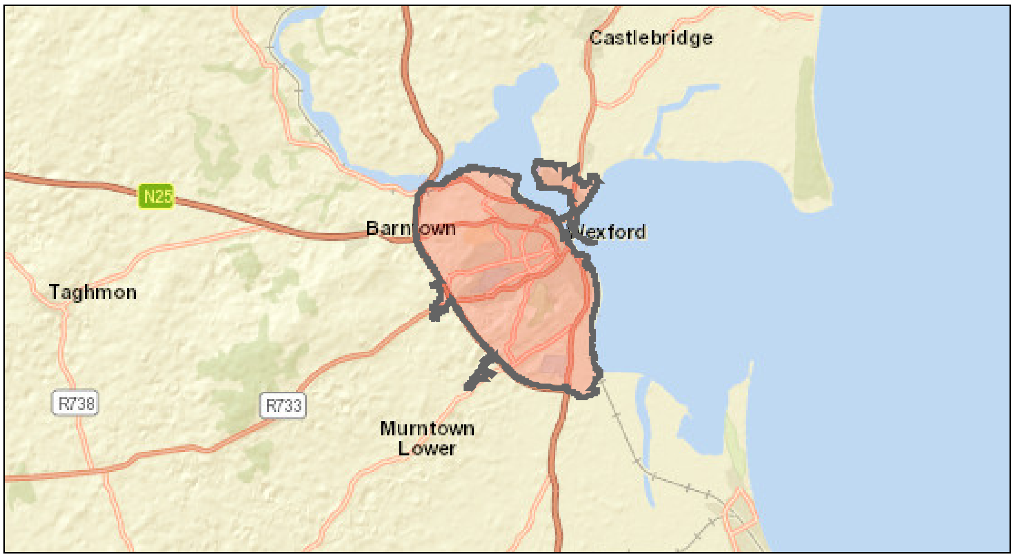
The proposed development will bring a new population to the area. This will support existing schools, shops, public transport and the local community and has the potential to reverse population decrease, stabilize rents through increased supply and contribute to the viability of much needed third level education facilities for the County.

It is considered that the effects on population and human health will be moderate, positive and long term. No long term negative effects are envisaged.

Appendix 5.1

Wexford Settlement Area Statistics 2011 and 2016

Central Statistics Office Ireland



Settlement Wexford Legal Town And Its Environs (CSO Area Code ST 14018)

Contact Census Enquiries : Tel: 353-1-8951460 | e-mail: **census@cso.ie**
Central Statistics Office, Swords Business Campus, Balheary Rd, Swords, Co. Dublin, Ireland.
Fax: 353-1-8951399 | LoCall: 1890 236 787 | e-mail: census@cso.ie

Settlement Wexford Legal Town And Its Environs (CSO Area Code ST 14018) Print Map

Population aged 0-19 by sex and year of age, persons aged 20+ by sex and age group

Age	Male	Female	Total
0	159	140	299
1	142	151	293
2	149	150	299
3	140	119	259
4	118	123	241
5	131	110	241
6	119	102	221
7	137	123	260
8	125	114	239
9	128	110	238
10	123	139	262
11	131	123	254
12	122	123	245
13	129	108	237
14	127	110	237
15	118	98	216
16	117	131	248
17	124	126	250
18	116	129	245
19	104	126	230
20-24	539	600	1,139
25-29	802	918	1,720
30-34	921	915	1,836
35-39	725	733	1,458
40-44	664	674	1,338
45-49	640	691	1,331
50-54	591	638	1,229
55-59	531	565	1,096
60-64	489	539	1,028
65-69	409	460	869
70-74	373	420	793
75-79	249	332	581
80-84	150	220	370
85+	85	185	270
Total	9,727	10,345	20,072

Population by sex and marital status

Status	Males	Females
Single	5,476	5,392
Married	3,413	3,444
Separated	308	373
Divorced	276	338
Widowed	254	798
Total	9,727	10,345

Usually resident population by place of birth and nationality

Location	Birthplace	Nationality
Ireland	16,472	16,894
UK	1,150	462
Poland	848	919
Lithuania	287	304
Other EU 27	503	483
Rest of World	548	422
Not stated	0	324
Total	19,808	19,808

Usually resident population by ethnic or cultural background

White Irish	16,465
White Irish Traveller	117
Other White	2,154
Black or Black Irish	117
Asian or Asian Irish	279
Other	154
Not stated	522
Total	19,808

Usually resident population aged 1 and over by usual residence 1 year before Census Day

Same Address	18,035
Elsewhere in County	1,051
Elsewhere in Ireland	266
Outside Ireland	159
Total	19,511

Population by religion

Catholic	17,184
Other stated religion	1,269
No religion	1,086
Not stated	533
Total	20,072

Speakers of foreign languages by language spoken

Language	Persons
Polish	865
French	152
Lithuanian	266
Other	1,134
Total	2,417

Speakers of foreign languages by ability to speak English

Ability	Persons
Very well	1,010
Well	832
Not well	411
Not at all	87
Not stated	77
Total	2,417

Population aged 3 or over by ability to speak Irish

Ability	Persons
Yes	6,649
No	11,950
Not stated	582
Total	19,181

Irish speakers aged 3 or over by frequency of speaking Irish

Speaks Irish Daily, within education system only	1,980
Speaks Irish Daily, within and also outside education system	111
Outside education system, Daily	122
Outside education system, Weekly	375
Outside education system, Less often	2,215
Outside education system, Never	1,778
Outside education system, Not stated	68
Total	6,649

Irish speakers within education aged 3+, by frequency of speaking Irish outside education

Frequency	Persons	Males	Females
Daily	46	17	29
Weekly	31	12	19
Less often	16	7	9
Never	18	8	10
Total	111	44	67

Families, family members and children in families, by size of family

Size of family	Number of families	Number of persons in families	Number of children in families
2 persons	2,453	4,906	719
3 persons	1,366	4,098	1,734
4 persons	960	3,840	2,032
5 persons	368	1,840	1,135
6 or more persons	143	907	633
Total	5,290	15,591	6,253

Family units with children by size and age of children

	All children under 15	All children 15 or over	Children both under and over 15	Total
No children	0	0	0	1,734
1 child	828	889	0	1,717
2 children	660	328	228	1,216
3 children	193	83	173	449
4 children	45	12	73	130
5 or more children	10	3	31	44

Family units with children by type of family and age of children

	Couples with children	Lone mothers with children	Lone fathers with children
Number of families			
All children aged under fifteen	1,155	551	30
All children aged fifteen or over	798	408	109
Other	361	133	11
Total number of family units	2,314	1,092	150
Number of children			
All children aged under fifteen	2,075	840	43
All children aged fifteen or over	1,159	565	133
Other	1,040	373	25
Total number of children	4,274	1,778	201

Families by age of youngest child

	Number of families	Number of family members
0-4 years	1,095	3,947
5-9 years	605	2,203
10-14 years	541	2,003
15-19 years	453	1,498
20+ years	862	2,472
Total	3,556	12,123

Families by family cycle

Family cycle	Number of families	Number of family members
Pre-family	581	1,162
Empty nest	633	1,266
Retired	520	1,040
Pre-school	618	1,847
Early school	540	1,850
Pre-Adolescent	578	2,152
Adolescent	667	2,509
Adult	1,153	3,765
Total	5,290	15,591

Females aged 20 years or over by number of children born alive

Number of children born	Number of females
0	2,273
1	1,159
2	1,640
3	1,086
4 or more	1,378
Total	7,536

Private households by type

Type of Household	Households	Persons
One person	2,344	2,344
Husband and wife	1,180	2,360
Cohabiting couple	393	786
Husband, wife and children	1,795	7,011
Cohabiting couple and children	349	1,276
Father and children	129	304
Mother and children	930	2,487
Couple and others	113	361
Couple, children and others	130	636
Father, children and others	13	41
Mother, children and others	81	296
Two or more family units	88	437
Non-family households and relations	179	401
Two or more non-related persons	256	616
Total	7,980	19,356

Private households by size

Size of family	Households	Persons
1 person	2,344	2,344
2 persons	2,487	4,974
3 persons	1,461	4,383
4 persons	1,048	4,192
5 persons	444	2,220
6 persons	148	888
7 persons	34	238
8 or more persons	14	117
Total	7,980	19,356

Private households by type of accommodation

Type of accommodation	Households	Persons
House/Bungalow	7,021	17,758
Flat/Apartment	789	1,226
Bed-sit	16	20
Caravan/Mobile Home	2	2
Not stated	152	350
Total	7,980	19,356

Permanent private households by year built

Year Built	Households	Persons
Pre 1919	678	1,395
1919 to 1945	555	1,187
1946 to 1960	627	1,396
1961 to 1970	593	1,393
1971 to 1980	903	2,186
1981 to 1990	799	2,010
1991 to 2000	1,506	3,926
2001 to 2005	1,092	2,849
2006 or later	720	1,838
Not stated	505	1,174
Total	7,978	19,354

Permanent private households by type of occupancy

Type of occupancy	Households	Persons
Owner occupied with mortgage	2,305	6,591
Owner occupied no mortgage	2,578	5,514
Rented from Private Landlord	1,920	4,399
Rented from Local Authority	880	2,252
Rented from Voluntary Body	87	209
Occupied free of rent	98	178
Not stated	110	211
Total	7,978	19,354

Permanent private households by number of rooms

Number of rooms	Households	Persons
1 room	68	83
2 rooms	412	678
3 rooms	791	1,668
4 rooms	1,130	2,299
5 rooms	2,493	6,192
6 rooms	1,407	3,754
7 rooms	693	1,989
8 or more rooms	678	2,011
Not stated	306	680
Total	7,978	19,354

Permanent private households by central heating	
No central heating	203
Oil	5,023
Natural Gas	131
Electricity	1,093
Coal (including anthracite)	1,251
Peat (including turf)	12
Liquid Petroleum Gas (LPG)	85
Wood (including wood pellets)	44
Other	27
Not stated	109
Total	7,978

Permanent private households by water supply	
Public main	7,211
Group scheme with local authority source	406
Group scheme with private source	15
Other private source	95
None	1
Not stated	250
Total	7,978

Permanent private households by sewerage facility	
Public scheme	7,186
Individual septic tank	416
Other individual treatment	50
Other	33
No sewerage facility	12
Not stated	281
Total	7,978

Occupancy status of permanent dwellings on Census night	
Occupied	8,014
Unoccupied	1,496
Total	9,510

Persons in Communal Establishments	
Number of establishments	29
Number of persons	880

Population aged 15 years and over by principal economic status and sex			
Principal Economic Status	Male	Female	Total
At work	3,581	3,625	7,206
Looking for first regular job	113	90	203
Unemployed having lost or given up previous job	1,492	781	2,273
Student	624	757	1,381
Looking after home/family	86	1,519	1,605
Retired	1,316	1,225	2,541
Unable to work due to permanent sickness or disability	526	483	1,009
Other	9	20	29
Total	7,747	8,500	16,247

Population by sex and social class			
Social Class	Male	Female	Total
Professional workers	580	418	998
Managerial and technical	1,978	2,322	4,300
Non-manual	1,339	2,418	3,757
Skilled manual	2,052	1,148	3,200
Semi-skilled	1,406	1,187	2,593
Unskilled	617	533	1,150
All others gainfully occupied and unknown	1,755	2,319	4,074
Total	9,727	10,345	20,072

Persons in private households by socio-economic group of reference person		
Socio-economic group of reference person	Households	Persons
A Employers and managers	968	2,503
B Higher professional	379	945
C Lower professional	814	1,798
D Non-manual	1,715	4,230
E Manual skilled	836	2,162
F Semi-skilled	822	2,099
G Unskilled	468	1,193
H Own account workers	304	803
I Farmers	43	121
J Agricultural workers	22	54
Z All others gainfully occupied and unknown	1,609	3,448
Total	7,980	19,356

Population aged 15 years and over by age education ceased			
Age	Males	Females	Total
Under 15 years	628	567	1,195
15	457	394	851
16	773	689	1,462
17	651	724	1,375
18	839	911	1,750
19	244	335	579
20	218	219	437
21 and over	1,021	1,232	2,253
Not stated	1,818	2,148	3,966
Total	6,649	7,219	13,868

Population aged 15 years and over whose education has not ceased			
Education	Males	Females	Total
Still at school	624	757	1,381
Other	474	524	998

Population aged 15 years and over by field of study			
Qualification	Males	Females	Total
Education and teacher training	120	408	528
Arts	81	120	201
Humanities	88	97	185
Social sciences, Business and Law	541	989	1,530
Science, Mathematics and Computing	270	241	511
Engineering, Manufacturing and Construction	1,000	90	1,090
Agriculture and Veterinary	112	30	142
Health and Welfare	147	637	784
Services	265	342	607
Other subjects	2	8	10
Not Stated (including unknown)	4,023	4,257	8,280
Total	6,649	7,219	13,868

Population aged 15 years and over by sex and highest level of education completed			
Education Level	Males	Females	Total
No Formal Education	95	125	220
Primary Education	1,002	1,066	2,068
Lower Secondary	1,427	1,357	2,784
Upper Secondary	1,346	1,528	2,874
Technical or Vocational qualification	608	674	1,282
Advanced Certificate/Completed Apprenticeship	427	258	685
Higher Certificate	264	325	589
Ordinary Bachelor Degree or National Diploma	389	462	851
Honours Bachelor Degree, Professional qualification or both	384	542	926
Postgraduate Diploma or Degree	285	380	665
Doctorate(Ph.D) or higher	49	12	61
Not stated	373	490	863
Total	6,649	7,219	13,868

Population aged 5 years and over by means of travel to work, school or college	
On foot	2,819
Bicycle	117
Bus, minibus or coach	368
Train, DART or LUAS	23
Motorcycle or scooter	23
Car driver	4,362
Car passenger	2,237
Van	331
Other	239
Not stated	340
Total	10,859

Population aged 5 years and over by time leaving home to travel to work, school or college	
Before 06:30	467
06:30-07:00	433
07:01-07:30	527
07:31-08:00	1,182
08:01-08:30	2,120
08:31-09:00	3,686
09:01-09:30	699
After 09:30	1,104
Not stated	424
Total	10,642

Population aged 5 years and over by journey time to work, school or college	
Under 15 mins	6,209
1/4 hour - under 1/2 hour	2,550
1/2 hour - under 3/4 hour	725
3/4 hour - under 1 hour	161
1 hour - under 1 1/2 hours	239
1 1/2 hours and over	183
Not stated	575
Total	10,642

Persons with disability by age group	
00-14	208
15-24	232
25-44	671
45-64	1,037
65+	1,015
Total	3,163

Carers by sex and number of unpaid hours per week

Number of hours	Males	Females
1-14	128	188
15-28	46	75
29-42	28	39
43+	78	112
Not stated	42	53
Total	322	467

Population by general health and sex

Health	Males	Females	Total
Very good	5,508	5,746	11,254
Good	2,842	3,064	5,906
Fair	869	975	1,844
Bad	161	163	324
Very bad	39	31	70
Not stated	308	366	674
Total	9,727	10,345	20,072

Persons at work or unemployed by occupation and sex

Occupation	Males	Females	Total
Managers, Directors and Senior Officials	404	266	670
Professional Occupations	490	659	1,149
Associate Professional and Technical Occupations	456	312	768
Administrative and Secretarial Occupations	168	734	902
Skilled Trades Occupations	1,273	118	1,391
Caring, Leisure and Other Service Occupations	128	479	607
Sales and Customer Service Occupations	297	682	979
Process, Plant and Machine Operatives	594	150	744
Elementary Occupations	750	575	1,325
Not stated	513	431	944
Total	5,073	4,406	9,479

Persons at work by industry and sex

Industry	Males	Females
Agriculture, forestry and fishing	58	3
Building and construction	264	28
Manufacturing industries	579	209
Commerce and trade	936	1,038
Transport and communications	278	66
Public administration	271	293
Professional services	432	1,149
Other	763	839
Total	3,581	3,625

Number of households with cars	
No motor car	2,007
One motor car	3,896
Two motor cars	1,763
Three motor cars	259
Four or more motor cars	53

Number of households with a personal computer	
Yes	5,359
No	2,428
Not stated	191
Total	7,978

Number of households with internet access	
Broadband	4,709
Other	633
No	2,453
Not stated	183
Total	7,978

An Phríomh-Oifig Staidrimh
Central Statistics Office

Census 2016 Sapmap Area: Settlement Wexford

Theme 1: Sex, Age and Marital Status

Population aged 0 - 19 by sex and year of age, population aged 20+ by sex and age group

Age Group	Male	Female	Total
0	125	117	242
1	129	137	266
2	129	136	265
3	137	113	250
4	151	132	283
5	154	135	289
6	117	126	243
7	144	148	292
8	134	113	247
9	129	115	244
10	132	106	238
11	112	110	222
12	135	129	264
13	117	100	217
14	117	106	223
15	122	140	262
16	118	114	232
17	119	121	240
18	144	118	262
19	96	99	195
20-24	481	544	1,025
25-29	629	695	1,324
30-34	770	880	1,650
35-39	833	839	1,672
40-44	700	697	1,397
45-49	634	657	1,291
50-54	606	703	1,309
55-59	578	606	1,184
60-64	524	541	1,065
65-69	480	533	1,013
70-74	366	444	810
75-79	304	365	669
80-84	190	254	444
85+	128	231	359
Total	9,784	10,404	20,188

Population by sex and marital status

Marital Status	Male	Female	Total
Single	5,448	5,353	10,801
Married (incl. same sex civil partnership)	3,481	3,497	6,978
Separated	289	354	643
Divorced	276	396	672
Widowed	290	804	1,094
Total	9,784	10,404	20,188

Theme 2: Migration, Ethnicity, Religion and Foreign Languages

Usually resident population by place of birth and nationality

Location	Birthplace	Nationality
Ireland	16,692	17,245
UK	1,115	484
Poland	781	836
Lithuania	223	255
Other EU 28	525	497
Rest of World	653	363
Not stated	0	309
Total	19,989	19,989

Usually resident population by ethnic or cultural background

Ethnic or Cultural Background	Persons
White Irish	16,512
White Irish Traveller	118
Other White	2,162
Black or Black Irish	106
Asian or Asian Irish	345
Other	270
Not stated	476
Total	19,989

Usually resident population aged 1 year and over by usual residence 1 year before Census Day

Usual residence 1 year ago	Persons
Same Address	18,157
Elsewhere in County	1,034
Elsewhere in Ireland	290
Outside Ireland	266
Total	19,747

Population by religion

Religion	Persons
Catholic	16,489
Other stated religion	1,400
No religion	1,817
Not stated	482
Total	20,188

Speakers of foreign languages by language spoken

Language	Persons
Polish	934
French	170
Lithuanian	243
Other	1,312
Total	2,659

Speakers of foreign languages by ability to speak English

Ability to speak English	Persons
Very well	1,361
Well	829
Not well	317
Not at all	78
Not stated	74
Total	2,659

Theme 3: Irish Language

Population aged 3 years and over by ability to speak Irish

Ability to speak Irish	Persons
Yes	6,505
No	12,327
Not stated	583
Total	19,415

Irish speakers aged 3 years and over by frequency of speaking Irish

Frequency of speaking Irish	Male	Female	Total
Speaks Irish daily only within the education system	972	1,140	2,112
Speaks Irish daily within and daily outside the education system	21	33	54
Speaks Irish daily within and weekly outside the education system	4	16	20
Speaks Irish daily within and less often outside the education system	6	7	13
Speaks Irish daily within and never outside the education system	7	9	16
Speaks Irish daily only outside the education system	57	64	121
Speaks Irish weekly only outside the education system	169	186	355
Speaks Irish less often only outside the education system	912	1,124	2,036
Never speaks Irish	722	1,003	1,725
Not stated	23	30	53
All Irish speakers	2,893	3,612	6,505

Theme 4: Families

Families, family members and children in families, by size of family

Size of family	Number of families	Number of persons in families	Number of children in families
2 persons	2,454	4,908	748
3 persons	1,347	4,041	1,724
4 persons	1,042	4,168	2,178
5 persons	383	1,915	1,180
6 or more persons	121	766	536
Total	5,347	15,798	6,366

Family units with children, by size and age of children

Number of children	All children under 15	All children 15 or over	Children both under and over 15	Total
No children	0	0	0	1,706
1 child	780	938	0	1,718
2 children	696	373	256	1,325
3 children	209	79	158	446
4 children	27	13	73	113
5 or more children	15	1	23	39
Total	1,727	1,404	510	5,347

Family units with children, by type of family and age of children

Age of children	Couples with children	Mothers with children	Fathers with children
Number of families			
All children under 15	1,208	491	28
All children 15 and over	816	479	109
Children both under and over 15	355	150	5
Total	2,379	1,120	142
Number of children			
All children under 15	2,199	744	45
All children 15 and over	1,216	626	136
Children both under and over 15	981	405	14
Total	4,396	1,775	195

Families by age of youngest child

Age of youngest child	Number of families	Number of family members
0-4 years	1,036	3,781
5-9 years	671	2,509
10-14 years	530	1,898
15-19 years	506	1,681
20+ years	898	2,517
Total	3,641	12,386

Families by family cycle

Family cycle	Number of families	Number of family members
Pre-family	483	966
Empty nest	619	1,238
Retired	604	1,208
Pre-school	546	1,636
Early school	607	2,178
Pre-adolescent	574	2,109
Adolescent	709	2,599
Adult	1,205	3,864
Total	5,347	15,798

Females aged 20 years or over by number of children born

Number of children born	Number of females
0	2,170
1	1,209
2	1,859
3	1,162
4 or more	1,271
Total	7,671

Theme 5: Private Households

Private households by type

Type of Household	Households	Persons
One person	2,389	2,389
Married couple	1,203	2,406
Cohabiting couple	363	726
Married couple and children	1,786	6,967
Cohabiting couple and children	456	1,675
Father and children	124	295
Mother and children	934	2,456
Couple and others	75	239
Couple, children and others	86	426
Father, children and others	15	51
Mother, children and others	93	328
Two or more family units	106	539
Non-family households and relations	157	347
Two or more non-related persons	243	588
Total	8,030	19,432

Private households by size

Size of household	Households	Persons
1 person	2,389	2,389
2 persons	2,473	4,946
3 persons	1,432	4,296
4 persons	1,113	4,452
5 persons	452	2,260
6 persons	126	756
7 persons	32	224
8 or more persons	13	109
Total	8,030	19,432

Theme 6: Housing

Private households by type of accommodation

Type of accommodation	Households	Persons
House/Bungalow	7,002	17,656
Flat/Apartment	917	1,523
Bed-sit	9	13
Caravan/Mobile Home	4	4
Not stated	98	236
Total	8,030	19,432

Permanent private households by year built

Period Built	Households	Persons
Pre 1919	658	1,331
1919 - 1945	534	1,140
1946 - 1960	645	1,335
1961 - 1970	570	1,301
1971 - 1980	928	2,195
1981 - 1990	798	1,933
1991 - 2000	1,482	3,796
2001 - 2010	1,719	4,741
2011 or later	91	248
Not stated	601	1,408
Total	8,026	19,428

Permanent private households by type of occupancy

Type of occupancy	Households	Persons
Owner occupied with mortgage	1,988	5,860
Owner occupied no mortgage	2,809	5,720
Rented from Private Landlord	1,846	4,505
Rented from Local Authority	1,014	2,555
Rented from Voluntary Body	69	164
Occupied free of rent	87	167
Not stated	213	457
Total	8,026	19,428

Permanent private households by number of rooms

Number of rooms	Households	Persons
1 room	74	102
2 rooms	454	775
3 rooms	853	1,872
4 rooms	1,073	2,162
5 rooms	2,529	6,325
6 rooms	1,390	3,734
7 rooms	639	1,844
8 or more rooms	601	1,726
Not stated	413	888
Total	8,026	19,428

Permanent private households by central heating

Central heating	Households
No central heating	166
Oil	4,827
Natural Gas	133
Electricity	1,027
Coal (incl. Anthracite)	1,469
Peat (incl. turf)	16
Liquid Petroleum Gas (LPG)	106
Wood (incl. wood pellets)	63
Other	46
Not stated	173
Total	8,026

Permanent private households by water supply

Type of water supply	Households
Public main	7,525
Group scheme with public source	119
Group scheme with private source	20
Other private source	84
None	4
Not stated	274
Total	8,026

Permanent private households by sewerage facility

Type of sewerage facility	Households
Public scheme	7,359
Individual septic tank	282
Other individual treatment	40
Other	29
No sewerage facility	11
Not stated	305
Total	8,026

Occupancy status of permanent dwellings on Census night

Occupancy Status	Permanent Dwellings
Occupied	8,053
Temporarily absent	228
Unoccupied holiday homes	167
Other vacant dwellings	990
Total	9,438

Theme 7: Communal Establishments

Number of communal establishments and persons in communal establishments

Communal Establishments	Total
Number of establishments	30
Number of persons	823

Theme 8: Principal Status

Population aged 15 years and over by principal economic status and sex

Principal Economic Status	Male	Female	Total
At work	4,067	3,861	7,928
Looking for first regular job	94	57	151
Unemployed having lost or given up previous job	902	621	1,523
Student	662	719	1,381
Looking after home/family	101	1,236	1,337
Retired	1,444	1,512	2,956
Unable to work due to permanent sickness or disability	534	536	1,070
Other	18	39	57
Total	7,822	8,581	16,403

Theme 9: Social Class and Socio-Economic Group

Population by sex and social class

Social Class	Male	Female	Total
Professional workers	584	433	1,017
Managerial and technical	2,089	2,516	4,605
Non-manual	1,532	2,559	4,091
Skilled manual	1,812	1,021	2,833
Semi-skilled	1,520	1,240	2,760
Unskilled	565	526	1,091
All others gainfully occupied and unknown	1,682	2,109	3,791
Total	9,784	10,404	20,188

Persons in private households by socio-economic group of reference person

Socio-economic group of reference person	Households	Persons
A Employers and managers	939	2,436
B Higher professional	391	1,019
C Lower professional	924	2,157
D Non-manual	1,864	4,486
E Manual skilled	703	1,835
F Semi-skilled	881	2,265
G Unskilled	462	1,163
H Own account workers	293	724
I Farmers	40	103
J Agricultural workers	24	64
Z All others gainfully occupied and unknown	1,509	3,180
Total	8,030	19,432

Theme 10: Education

Population aged 15 years and over by age education ceased

Age	Males	Females	Total
Under 15 years	587	573	1,160
15	471	390	861
16	708	699	1,407
17	675	729	1,404
18	850	966	1,816
19	266	324	590
20	193	261	454
21 and over	1,269	1,551	2,820
Not stated	1,697	1,897	3,594
Total	6,716	7,390	14,106

Population aged 15 years and over whose education has not ceased

Education	Males	Females	Total
Still at school or college	662	719	1,381
Other	444	472	916

Population aged 15 years and over by field of study

Qualification	Males	Females	Total
Education and teacher training	126	444	570
Arts	119	146	265
Humanities	103	111	214
Social sciences, Business and Law	551	989	1,540
Science, Mathematics and Computing	253	213	466
Engineering, Manufacturing and Construction	880	100	980
Agriculture and Veterinary	103	24	127
Health and Welfare	177	767	944
Services	246	348	594
Other subjects	9	10	19
Not Stated (incl. unknown)	4,149	4,238	8,387
Total	6,716	7,390	14,106

Population aged 15 years and over by sex and highest level of education completed

Education Level	Males	Females	Total
No Formal Education	125	136	261
Primary Education	857	957	1,814
Lower Secondary	1,360	1,290	2,650
Upper Secondary	1,393	1,549	2,942
Technical or Vocational qualification	593	740	1,333
Advanced Certificate/Completed Apprenticeship	427	250	677
Higher Certificate	268	348	616
Ordinary Bachelor Degree or National Diploma	393	509	902
Honours Bachelor Degree, Professional qualification or both	478	702	1,180
Postgraduate Diploma or Degree	380	500	880
Doctorate(Ph.D) or higher	44	25	69
Not stated	398	384	782
Total	6,716	7,390	14,106

Theme 11: Commuting

Population aged 5 years and over by means of travel to work, school or college

Means of Travel	Work	School or College	Total
On foot	1,348	1,273	2,621
Bicycle	150	40	190
Bus, minibus or coach	159	209	368
Train, DART or LUAS	10	13	23
Motorcycle or scooter	26	1	27
Car driver	4,480	122	4,602
Car passenger	641	2,016	2,657
Van	387	6	393
Other (incl. lorry)	19	0	19
Work mainly at or from home	219	2	221
Not stated	374	158	532
Total	7,813	3,840	11,653

Population aged 5 years and over by time leaving home to travel to work, school or college

Time leaving home	Persons
Before 06:30	578
06:30-07:00	556
07:01-07:30	682
07:31-08:00	1,368
08:01-08:30	2,280
08:31-09:00	3,711
09:01-09:30	562
After 09:30	1,083
Not stated	612
Total	11,432

Population aged 5 years and over by journey time to work, school or college

Journey time	Persons
Under 15 mins	6,411
1/4 hour - under 1/2 hour	2,658
1/2 hour - under 3/4 hour	789
3/4 hour - under 1 hour	171
1 hour - under 1 1/2 hours	284
1 1/2 hours and over	286
Not stated	833
Total	11,432

Theme 12: Disability, Carers and General Health

Persons with a disability by sex

Disability	Male	Female	Total
Total	1,694	1,964	3,658

Carers by sex

Carers	Male	Female	Total
Total	310	486	796

Population by general health and sex

General Health	Male	Female	Total
Very good	5,425	5,674	11,099
Good	2,795	3,052	5,847
Fair	991	1,111	2,102
Bad	196	216	412
Very bad	35	51	86
Not stated	342	300	642
Total	9,784	10,404	20,188

Theme 13: Occupations

Persons at work or unemployed by occupation and sex

Occupation	Male	Female	Total
Managers, Directors and Senior Officials	364	242	606
Professional Occupations	519	704	1,223
Associate Professional and Technical Occupations	484	378	862
Administrative and Secretarial Occupations	224	652	876
Skilled Trades Occupations	1,028	97	1,125
Caring, Leisure and Other Service Occupations	153	525	678
Sales and Customer Service Occupations	364	739	1,103
Process, Plant and Machine Operatives	623	156	779
Elementary Occupations	689	542	1,231
Not stated	521	447	968
Total	4,969	4,482	9,451

Theme 14: Industries

Persons at work by industry and sex

Industry	Male	Female	Total
Agriculture, forestry and fishing	68	8	76
Building and construction	361	34	395
Manufacturing industries	648	202	850
Commerce and trade	951	1,085	2,036
Transport and communications	295	99	394
Public administration	252	234	486
Professional services	568	1,286	1,854
Other	924	913	1,837
Total	4,067	3,861	7,928

Theme 15: Motor Car Availability, PC Ownership and Internet Access

Number of households with cars

Motor cars	Households
No motor car	1,844
One motor car	3,970
Two motor cars	1,761
Three motor cars	196
Four or more motor cars	50
Not stated	205
Total	8,026

Number of households with a personal computer

Personal Computer	Households
Yes	4,966
No	2,814
Not stated	246
Total	8,026

Number of households with internet access

Internet Access	Households
Broadband	5,295
Other	643
No	1,882
Not stated	206
Total	8,026

Central Statistics Office,
Swords Business Campus,
Balheary Road,
Swords,
Co.Dublin,
K67 D2X4

Tel: 353-1-895 1460, Fax: 353-1-895 1399
census@cso.ie

6 Biodiversity (flora and fauna)

6.1 Introduction

This section of the EIAR has been prepared by Deborah D'Arcy Ecologist ACIEEM with contributions from Dr Tom Gittings Consultant Ecologist MCIEEM and Ross Macklin Consultant Ecologist MCIEEM. The objective of the biodiversity assessment is to assess the potential direct, indirect and cumulative impacts on flora and fauna as a result of the proposed development of the lands at Carcur Park. Tom Gittings undertook the ornithological assessment for this report and provided advice and review of the final document. Ross Macklin carried out the detailed otter survey and reporting.

About the authors

Deborah D'Arcy is an Ecologist with a MSc in Ecological Assessment and 8 years' experience working in ecological consultancy. Deborah also holds a B.A. in Natural Sciences and a MSc in Environmental Resource Management. Deborah is competent in habitat classification, botanical surveying and general ecology surveys and has previous experience of appropriate assessment and ecological assessments for a range of development types including residential, quarry, and solar farm developments.

Ross Macklin is a freshwater and fisheries ecological consultant. He studied a Bachelors Degree in Environmental Science at U.C.C. and later completed a higher diploma in Geographical Information Systems and Integrated Pest Management. He is currently completing his PhD in U.C.C. in the area of fisheries ecology. Ross has an in depth knowledge of all freshwater ecosystems and riparian corridors. He has undertaken river habitat, lake habitat, wetland habitat and fisheries assessments in professional work for 15 years. His specialist freshwater experience lies in biological and physiochemical water quality analysis, fisheries ecology, riparian habitat assessments, habitat mapping, protected species translocation, otter surveys, geographical information systems, ecological design and invasive species. He routinely undertakes Natura Impact Screening, Natura Impact Statements, Pollution Audits, Fisheries Assessments, Protected Species Surveys, Invasive Species Surveys, Habitat & Surface Water Management Plans, EcIA, EIAR, EIA reporting.

Dr Tom Gittings is an ecologist with 24 years' experience in ecological consultancy and research. He has been carrying out professional bird survey and assessment work since 1989 and has carried out academic research and consultancy work on a wide range of bird species and their habitats. Since 2010, he has been working on a variety of projects for the Marine Institute relating to the Appropriate Assessment of aquaculture and shellfisheries in coastal SPAs. This has included developing and implementing research programmes studying the interactions between waterbirds and aquaculture and fisheries activities in coastal SPAs to provide the information base required for the assessments. As part of this work, he has also written Appropriate Assessment reports for eight coastal SPAs, including Wexford Harbour.

This report has been produced using all reasonable skill and care. As members of the Chartered Institute of Ecology and Environmental Management, the chief professional body for Ecologists in Ireland, Deborah, Tom and Ross are bound by their professional code of conduct.

6.2 Methodology

This biodiversity (flora and fauna) assessment has been prepared in accordance with relevant legislation and best practice guidance including:

- The Chartered Institute of Ecology and Environmental Management *Guidelines for Ecological Impact Assessment in the UK and Ireland: terrestrial, freshwater and coastal 2nd Edition*. CIEEM (2018).
- The EPA's Draft Advice Notes on Preparing Environmental Impact Statements (EPA, 2015).
- The EPA's Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2017).
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009).

6.2.1 Desktop research

A desk study was carried out to gather information on the ecology of the site and surrounding areas. References reviewed are named where appropriate. Locations and boundaries of all designated sites potentially impacted by the proposed development were identified using the National Parks and Wildlife Service (NPWS) online map viewer. The current boundary shapefiles (SAC 2019/12, SPA 2019/12, pNHA 2015/11) were downloaded from the NPWS website and incorporated into a QGIS mapping project for the proposed development. Other mapping reviewed included the Coastal Monitoring Project 2004-2006, EPA river routes, OSI maps, aerial photography and EPA maps (https://gis.epa.ie/EPAMaps/).

Information on the conservation objectives, conditions and threats of the Natura 2000 sites was obtained from conservation objectives documents, site synopses and Standard Natura 2000 data forms. Site synopses of pNHAs were reviewed.

Existing ecological records for the site and surrounding area were reviewed including data from the National Biodiversity Data Centre (NBDC), National Parks and Wildlife Service (NPWS) protected species database obtained by formal data request and botanical records from the Botanical Society of Britain and Ireland (BSBI) provided by Paul Green, BSBI vice-county recorder for Wexford (personal communication).

6.2.2 Consultations

Consultations were made with the National Parks and Wildlife Service (NPWS) and Inland Fisheries Ireland (IFI). Their response and advice has been taken into consideration in assessing the potential impact of the development and in the design of mitigations measures for this development. Copies of the response letters from Inland Fisheries Ireland and the NPWS are provided in Appendix 6.1. Consultation was also made with Bat Conservation Ireland. No response was received.

6.2.3 Field survey methodology

Habitat surveys of the site were carried out on 2nd and 19th September 2015 by Deborah D'Arcy assisted by graduate botanist Kane D'Arcy Cusack. During the course of the habitat survey, plant and animal species and other ecological features of interest were recorded. Account was taken of the general ecology of the site and particular attention was paid to any ecological features that may be of relevance to the assessment of impacts on the adjacent Natura sites. Habitats were classified according to the Heritage Council scheme (Fossitt, 2000) and Habitats Directive habitat types (European Commission, 2007) and mapped following Best Practice Guidance for Habitat Survey and Mapping (Smith *et al.* 2011). Further field surveys were conducted in April and May 2016 to survey the presence of the rare plant species on site. Previous plant records for the site were reviewed and the grid references for the plant species obtained from Mr Paul Green BSBI Vice County Recorder for Wexford. The locations were visited and searched for the presence of these plant species. A relevé survey was conducted in May 2016 to estimate the number of common cudweed plants (*Filago vulgaris*) an uncommon plant that occurs in the quarry pit. The number of common cudweed plants within a 2x2 m quadrat was counted.

A preliminary mammal survey was carried out on 24th November by Deborah D'Arcy and Dr Tom Gittings in view of the sites suitability as a habitat for otters, a qualifying interest of the Slaney Valley SAC. Ecological field signs of the presence of otters including spraints, tracks, potential holts and couching sites were recorded. A further detailed otter survey was commissioned and carried out by Ross Macklin during January and February 2016. A detailed report arising from this survey work is provided in Appendix 6.2

A survey of the shoreline was undertaken on 13th July 2020 to survey the locations of the outfall pipes. A survey for otter signs was also undertaken along the shoreline and at the pond to assess if there was any change in the level of activity recorded during surveys in 2015 and 2016. The proposed development site was walked over to access if there had been any substantial change in the habitats or flora since the previous habitat and flora surveys in 2015 and 2016.

A detailed wintering waterbird survey and assessment was carried out by Dr Tom Gittings in view of the potential impacts on wintering waterbirds of the adjacent Wexford Harbour and Slobs SPA. A detailed report arising from this survey work is included in Appendix 6.3.

Records of other bird species were also collected for the development site on each of the waterbird survey visits, while additional bird records were also collected during the habitat and otter surveys.

6.2.4 Waterbird survey methodology

The Wexford Harbour and Slobs SPA is a large site extending from Enniscorthy along the River Slaney to Wexford Harbour and including the North and South Slobs (Figure 6.1). Within the SPA, the area between Wexford Bridge and Ferrycarrig Bridge forms a discrete unit of estuarine habitat, which can be distinguished from the main harbour downstream of Wexford Bridge (dominated by open sandflats) and the tidal river habitat upstream of Ferrycarrig Bridge. This area is recognised as a distinct subsite for the purposes of waterbird monitoring (the Ferrycarrig subsite). The development site is in the middle of the southern shore of the Ferrycarrig subsite. Therefore, the Ferrycarrig subsite was defined as the main study area for this assessment. The Ferrycarrig subsite was divided into 13 sectors for the purposes of this study to allow assessment of waterbird distribution patterns within the subsite (Figure 6.2). Two sectors (S4 and S5) covered the sections adjoining the proposed development site, and a further two sectors (S3 and S6) covered adjacent areas.

The purpose of the waterbird counts carried out for this assessment was to establish the total numbers of waterbirds using the Ferrycarrig subsite at low tide, and to record the waterbird usage of the areas adjoining the development site at various tidal stages (low, ebb/flood and high tide). Counts were carried out on eight dates over the period September 2015-January 2016. On each count date, a full low tide count of the Ferrycarrig subsite was carried out. In addition, flood/ebb tide and high tide counts of the sectors adjacent to the development site were also carried out.

Disturbance recording was also carried out to assess the existing levels of human disturbance within the Ferrycarrig subsite and to obtain information on the sensitivity of the waterbird species to disturbance impacts. On each visit, a detailed record was kept of human activities with the potential to cause disturbance to waterbirds in the study area. On most visits, the responses were recorded of waterbirds in intertidal habitat in the sectors adjoining the development site to disturbance caused by the surveyor's presence, and/or by other human activity.

Notes were made on the extent of intertidal exposure at low tide on each survey day and these, combined with aerial imagery, were used to map the approximate extent of intertidal habitat exposed under moderate spring low tide conditions. It should be noted that the extent of intertidal habitat shown in Ordnance Survey mapping of Wexford Harbour, and used by NPWS in mapping for their conservation objectives, is based on historical data and bears no relationship to the current situation.

Full details of the survey methodology are provided in Appendix 6.3.

Figure 6.1. Wexford Harbour and Slobs SPA and the location of the Ferrycarrig subsite.

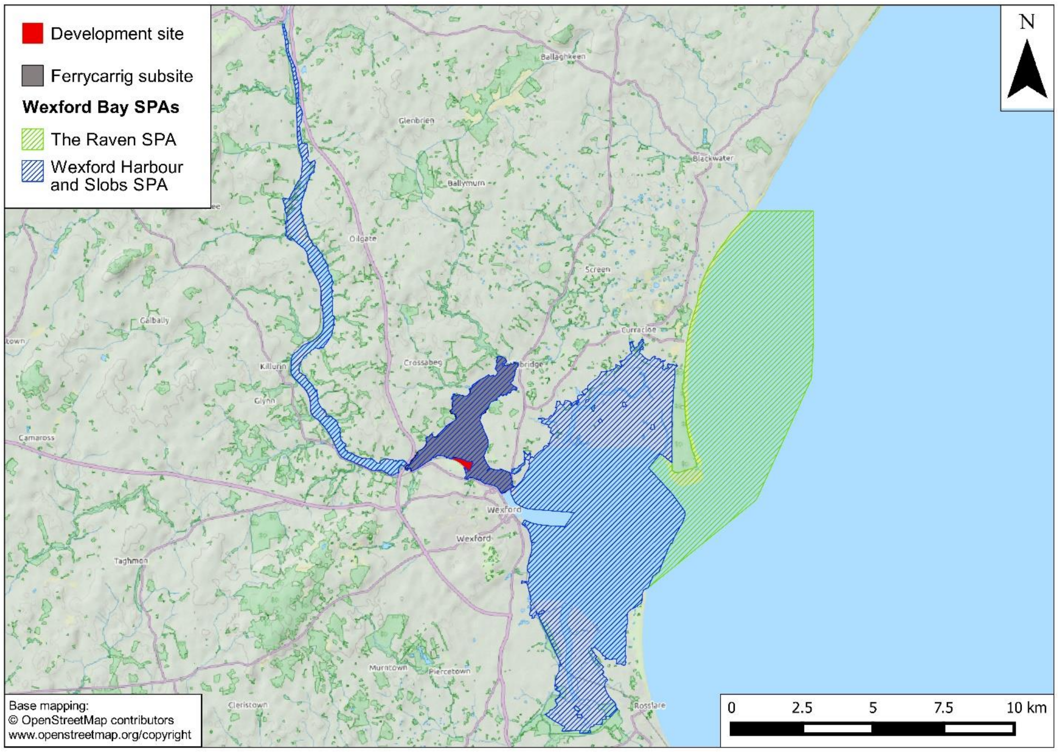
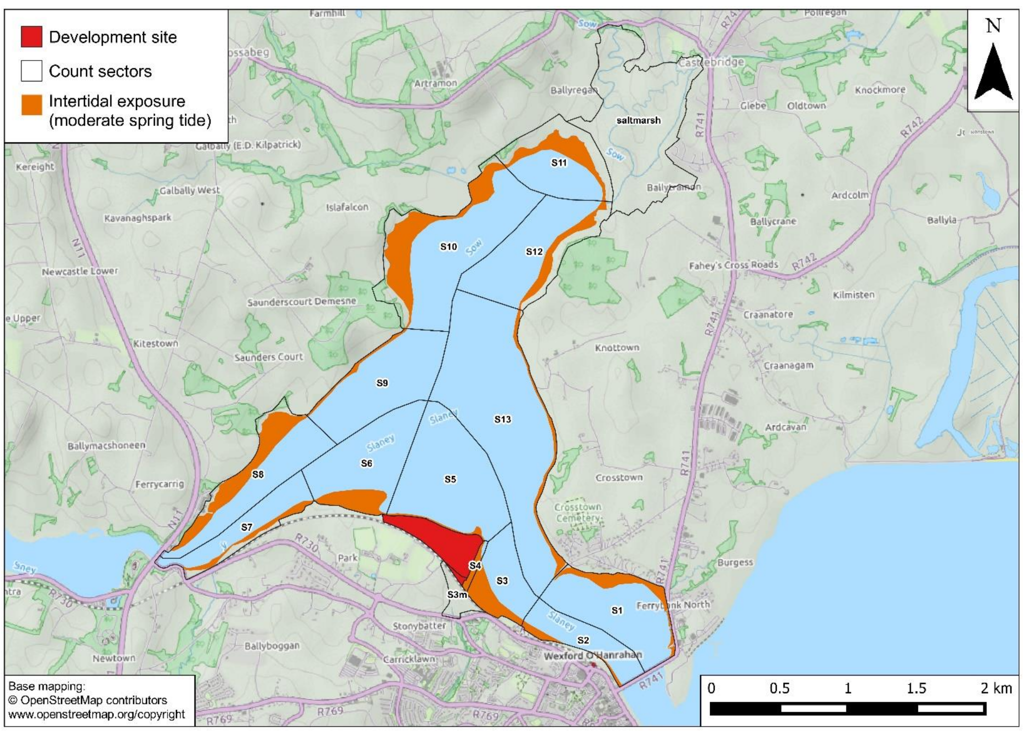


Figure 6.2. Count sectors used for waterbird monitoring counts, September 2015-January 2016



6.2.5 Validity of field surveys

Guidance from the Chartered Institute of Ecology and Environmental Management (CIEEM) on the lifespan of ecological reports and surveys (CIEEM, 2016) indicates that when more than three years have elapsed since survey work has been carried out, “surveys are likely to need to be updated (subject to an assessment by a professional ecologist)”. The survey work for this assessment was carried out in 2015-2016. Therefore, in the light of the CIEEM guidance, the need for updating the surveys has been considered.

A walkover survey of the site in July 2020 confirmed a expected that there was no noticeable change in the type of habitats present over the proposed development site except for general overall increased height scrub vegetation. A survey of the sand and gravel pit for the uncommon plant common cudweed (*Filago vulgaris*) revealed that there were far less plants present with only a few specimens evident. This reason for this change in the population was not evident.

The survey of the shoreline and otter pond confirmed the presence of otter with spraint noted along the northern shoreline and at the otter pond. Sprainting activity appeared less than that noted in previous surveys with just one spraint noted along the northern shoreline and one recorded at the otter pond. No new potential holts sites were noted.

The results of these surveys in July 2020 indicates that there has been no significant change in the baseline habitats, flora and otter activity since 2015/16 that would effect the validity of the impact assessment based on comprehensive surveys carried out in 2015/16.

In the case of the waterbird surveys, the impact assessments are based on the percentage occurrence in areas adjacent to the development site. As there have been no major changes to the overall extent of watebird habitats in Wexford Harbour, or to the extent and quality of the waterbird habitats adjacent to the development site, the relative usage patterns derived from the 2015-2016 waterbird surveys are likely to remain valid. Therefore, it is considered that the data from the 2015-2016 waterbird surveys provide an adequate basis for this assessment despite the time that has elapsed since these surveys.

6.2.6 Impact assessment methodology

Ecological features (habitats and species) were evaluated for their conservation importance according to the National Roads Authority’s scheme (NRA, 2009). Potential impacts from all phases of the project were assessed including the construction of the development, the presence of the residential development and associated infrastructure such as lighting and the associated human activities and took into account how the baseline conditions (the existing environment) will change. Cumulative impacts of the development and those arising from other developments were also assessed.

The significance of impacts to the adjacent Natura sites was assessed with reference to the conservation objectives and targets for those Natura sites. For other habitats or species, significance of effects was assessed with reference to their conservation status, abundance and distribution. A ‘significant effect’ is an effect that either supports or undermines biodiversity conservation objectives for ‘important ecological features’ or for biodiversity in general (CIEEM, 2016).

The significance of impacts on habitats and species was determined with reference to the value of the feature being affected and the magnitude of the impact. An impact is considered to be ecologically significant if it impacts the conservation status of the ecological receptor within a specified geographical area. Description of effects follows guidance outlined in the EPA *Draft Guidelines on the Information to be Contained in Environmental impact Assessment Reports* (EPA, 2017).

6.3 The Existing Environment

6.3.1 General site characteristics

The development site of 13.84 ha is located along the south bank of the River Slaney estuary in the townland of Park, Wexford (ITM centre coordinate points: 703456, 623244) and is adjacent to the Slaney River Valley SAC (site code: 000781) and Wexford Harbour and Slobs SPA (site code: 004076) as shown in Fig. 3 below. The Slaney Valley SAC overlaps the Slaney Valley pNHA.

Current access to the development site is via a bridge over the rail line leading to the centre of the site. The Rosslare to Dublin rail line runs adjacent to the southern boundary of the site which is composed of a treeline (WL2) and small stretch of linear semi-natural woodland (WN2) and south of the rail line are located sports playing grounds composed of amenity grassland (GA2). East of the sports grounds and east of the proposed access route into the development, there is an historic landfill site. The western boundary of the site is adjacent to oak-ash-hazel (WN2) woodland included in the adjacent Slaney River Valley SAC and Wexford Harbour and Slobs SPA. The south eastern boundary is adjacent to a reed bed (FS1) also included within the adjacent SAC and SPA site. Elsewhere the boundary of the site is demarcated by treelines, hedgerows and scrub.

The bedrock is classified as Ballysteen Formation (dark muddy limestone shale) at the centre of the site. The south eastern corner of the site is underlain by Shelmaliere Formation bedrock (white, purple quartzites with slates). Eastern areas of the sites are underlain by the Ballymartin Formation (limestone and dark grey calcareous shale) and the Porters Gate Formation (sandstone, shale and thin limestone).

The soil association is fine loamy drift with siliceous stones. Soil types are luvisols, surface and groundwater gleys with brown earths. The site is located on a Locally Important Aquifer (Lm) moderately productive bedrock. Groundwater vulnerability is classified as high (http://map.geohive.ie).

A concrete batching plant was previously operated on the site and the remains of that activity are evident including a cement tower, three small buildings (a small derelict cottage and storage sheds). Quarry pits and spoil heaps associated with aggregate extraction and mining activities are evident in the centre of the site. Review of OSI aerial photography for the site between 1995 and

2005 shows the extent of the previous quarrying activity being concentrated at the centre of the site to the east and west of the existing access track to the site. A number of tracks and possible further areas of extraction also occur throughout the central area of the site. Latest OSI aerial imagery captured between 2005 and 2012 shows these tracks were bordered by areas of scrub. These scrub areas have since been cleared and what remains in the central area of the site is a combination of gravel pits and spoil heaps with natural regeneration of vegetation to varying degrees of succession depending on the nature of the substrate and time since disturbance.

6.3.2 Designated sites

Figure 6.3 shows the location of all designated sites within 10 km of the development site.

The Natura 2000 is a network of sites of European conservation importance designated by EU Member States. In Ireland, these include Special Areas of Conservation (SACs), designated under the Habitats Directive (92/43/EEC) and Special Protection Areas (SPAs) for birds, designated under the Birds Directive (79/49/EEC and amendments as codified in 2009/147/EC).

A Natura Impact Statement (NIS) report has been produced in respect of this development. Natura sites within the zone of influence of the proposed development were determined to be:

- Slaney River Valley SAC
- Wexford Harbour and Slobs SPA
- The Raven Point SPA

Detailed characterisation of the sensitive receptors of the Slaney River Valley SAC and the Wexford Harbour and Slobs SPA and the Raven SPA and the potential impacts from the development to these sites has been described and assessed in the NIS and is not repeated here. These assessments were informed by the detailed otter survey and wintering waterbird surveys and assessment of the potential impacts of the development on the surface water quality of the adjacent estuary.

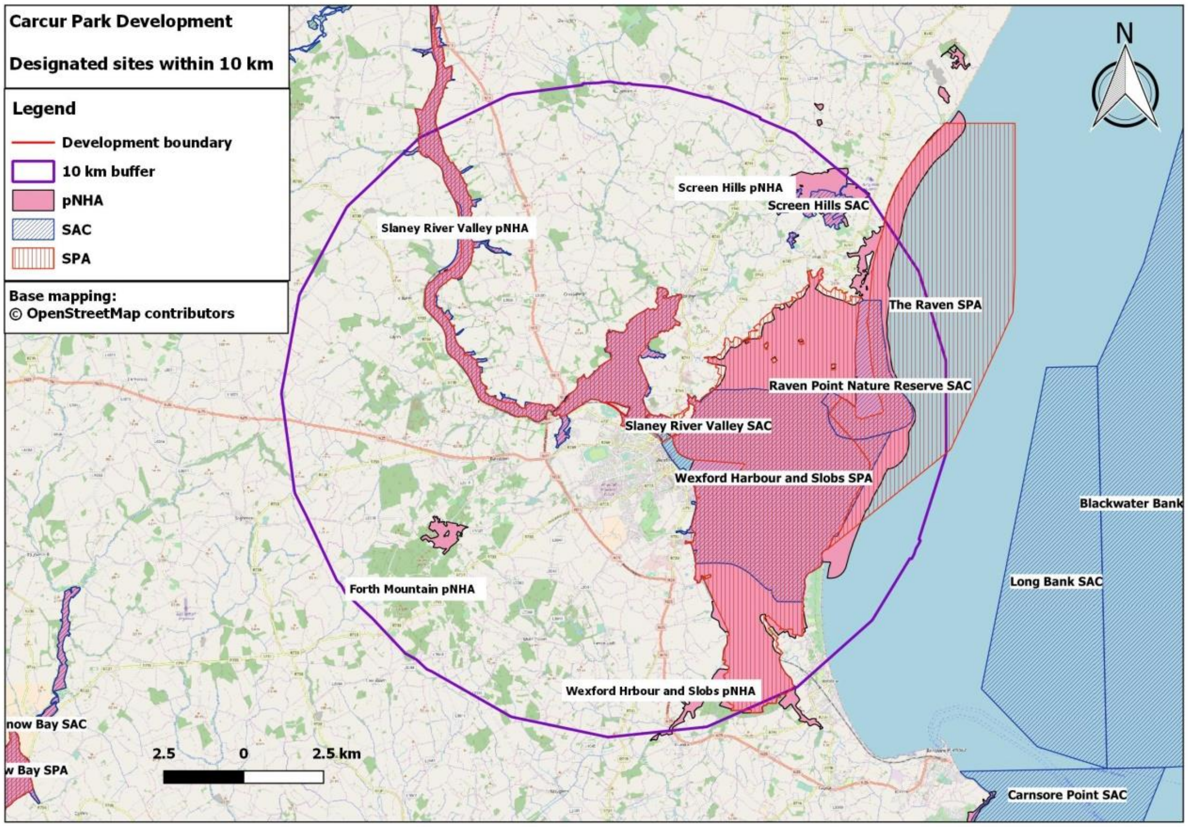
Nature reserves

A Nature Reserve is an area of importance to wildlife, which is protected under Ministerial order. There are two nature reserves within 10 km of the development site. Raven Point Nature Reserve SAC is also designated as a Nature Reserve. Wexford Wildfowl Reserve forms part of the Wexford Harbour and Slobs SPA.

Ramsar sites

The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Wexford Wildfowl Reserve was designated as a Ramsar site (No. 291) on the 15th November 1984. The Raven Point Nature reserve was also designated as a Ramsar Site (No. 333) on the 31st July 1986.

Figure 6.3 Designated sites within 10 km of the development site



Proposed Natural Heritage Areas

Proposed NHAs (pNHAs) are sites that have been formally proposed but not yet designated on a statutory basis. Under the Wildlife Amendment Act (2000), pNHAs are protected from damage from the date they are formally proposed for designation. The Slaney River valley pNHA overlaps the Slaney River Valley SAC. The screen Hills SAC partially overlaps the Screen Hills pNHA. There is one other pNHA within 10 km of the development site. A summary of this is provided below.

Forth Mountain pNHA

Forth Mountain is located about 7 km west of Wexford. It is a ridge of resistant Cambrian quartzite standing up above the softer slates of the region. Its thin acid soils have been widely used for afforestation and building, and only toward the summit does the natural vegetation prevail. Here the land is covered by heathland. Wet heath occurs on the lower slopes which grades into dry heath on the rockier ground. Forth Mountain is of ecological interest since it represents the most south-easterly heathland in the country. This community is not widespread and in many wetter regions has already passed to blanket bog.

Bird species which have been recorded breeding within the pNHA include Skylark, Meadow Pipit, Wheatear, Stonechat, Whitethroat and Linnet. The Common Lizard (*Zootoca vivipara*) occurs widely within the site. Within the site the snail (*Omphiscola glabra*, Order Gastropoda) has been recorded in a small stream on the south west slopes. This is one of the rarest snails in Ireland and is not currently known from any other sites. The site is in easy access to Wexford town and is a recognised amenity with considerable educational value.

6.3.3 Water quality

The EPA Water Quality maps indicate that the trophic status of the transitional water quality (2010-2012) for the Lower Slaney Estuary is potentially eutrophic, while the transitional water quality for the Upper Slaney estuary is classified as intermediate. The Wexford Harbour coastal water quality (2010-2012) is also potentially eutrophic. River water quality measured north of Enniscorthy in 2019 is good (Slaney; just west of Salsborough Bridge; Station code: RS12S022220). The River Slaney (Slaney _170) WFD status 2013-2018 is good.

The WFD status (2013-2018) for the upper Slaney estuary is good. The WFD status for Lower Slaney Estuary (2013-2018) is poor. The WFD coastal water Status (2013-2018) for Wexford Harbour is good. Data from the EPA Maps also indicates that the Lower Slaney Estuary is a nutrient sensitive area and there are shellfish areas in the estuary just north of the development site and also in Wexford Harbour.

Groundwater plays an essential role in the hydrological cycle and is critical for maintaining river levels and surface water ecosystems (EPA 2013). In many Irish rivers, more than 30% of the flow is derived from groundwater, rising to 90% in periods of low flow. Therefore, the quality of groundwater can have a major impact on the quality of a river water.
The ground waterbody WFD status (2013-2018) for Castlebridge North is good. The WFD groundwater risk assessment indicates that the groundwater body Castlebridge North is not at risk.

The SERBD is predominantly rural and diffuse pollution from agriculture combined with other small point sources such as domestic waste water treatment systems (DWWTS) and farmyards are significant pressures. The main pressures in the urban areas tend to be point source pressures such as discharges from wastewater treatment plants, industrial discharges and storm water overflows.

6.3.4 Habitats and flora

Habitats on site

A habitat map of the development site and immediate surrounding area is provided in Figure 6.4 and a list of plant species recorded is provided in Appendix 6.4.

Recolonising bare ground (ED3)

A substantial area of the site has been subject to disturbance from previous quarry activities and clearance of scrub and the dominant habitat at least in the centre of the site is recolonising bare ground (ED3) where disturbed ground and spoil heaps have been recolonized by native and non-native annual and ruderal plant species. The area of this habitat on site is approximately 4.2 ha. However due to variation in species richness over the site it has been estimated that the area of species-rich habitat is approximately 1 ha.

View of recolonising bare ground adjacent to existing access track

Plant species recorded in the more species rich area of habitat, which coincides with the area of previous quarrying activity to the south of the existing access track, include common thistle (*Cirsium arvense*), redshank (*Polygonum persicaria*), colt's foot (*Tussilago farfara*), willowherb species (*Epilobium* sp), rosebay willowherb *(Chamerion angustifolium*), wild carrot (*Daucus carota*), cat's ear (*Hypochaeris radicata)*, oxeye daisy (*Leucanthemum vulgare*) and dandelion species (*Taraxacum* agg.) all of which were frequent. Other species which were frequent or occasional included black medick (*Medicago lupulina*), lesser trefoil (*Trifolium dubium*), common fumitory (*Fumaria muralis*), cut leaved cranesbill (*Geranium dissectum),* weld (*Luteola reseda*), knapweed (*Centaurea nigra*), scarlet pimpernel (*Anagallis arvensis)I,* pineapple weed (*Matricaria discoidea*), ribwort (*Plantago lanceolata*) and common ragwort (*Senecio jacobea*). *Brassica* species were also frequent.

Sun spurge (*Euphorbia helioscopia*), prickly sow-thistle (*Sonchus asper*), smooth sow-thistle (*Sonchus oleraceus*), long-headed poppy (*Papaver dubium*), bristly oxtongue (*Picris echioides*), great mullein (*Verbascum thapsus*) and large bindweed (*Calystegia silvatica*) were occasional. Willow (*Salix* sp.) and birch (*Betula* sp.) saplings were also occasional in this habitat.

The invasive plant species winter heliotrope (*Petasites fragrans*), butterfly bush (*Buddliea davidii*), and Japanese knotweed (*Fallopia japonica*) occurred in some areas of this habitat. More detail on the occurrence of these invasive plant species is provided below

Another area of recolonising bare ground (ED3) composed of sand spoil is colonised by soft shield fern (*Polystichum setiferum*), hart's tongue fern (*Phyllitis scolopendrium*), ivy (*Hedera helix*), cleavers (*Galium aparine*), ground ivy (*Glechoma hederacea*), with occasional bittersweet (*Solanum dulcamara*) and wild rose (*Rosa* sp.). Also present were sheep's sorrel (*Rumex acetosella*), prickly sow-thistle, scarlet pimpernel (*Anagallis arvensis*), corn spurrey (*Spegula arvensis*) and field woundwort (*Stachys arvensis).* The uncommon plant sharp-leaved fluellen (*Kickxia elatine*) was found in this area. Only one specimen of this plant was recorded.

Conservation evaluation: This habitat contains small areas supporting a high diversity of common plant species in the local context. The habitat is evaluated as of local importance (lower value).

Spoil and bare ground (ED2)

Some areas of the disturbed ground persist as spoil or bare ground as the vegetation cover in these areas is sparse either due to more recent disturbance or due to the sandy nature of the substrate. The area of this habitat was approximately 1 hectare. The invasive plant species three-cornered leek (*Allium triquetrum*) was present in one area of recently disturbed ground in the east of the site.

Conservation evaluation: Negligible value

Exposed sand, gravel or till (ED1)

Exposed sand and gravel habitat in old quarry pit

An old quarry pit on the site has a sparse covering of plants and is best classified as exposed sand, gravel or till (ED1). The area of this habitat on site is approximately 2500 m^2. A sparse but diverse flora occurred on the base of the pit covering an area of approximately 1200 m^2. Plants colonising this area include frequent weld (*Reseda luteola*), wild carrot (*Daucus carota*), common centaury (*Centaurium erythraea*), black medick, common cudweed (*Filago vulgaris*), the non-native Bilbao's fleabane (*Conyza floribunda*) and willowherb species. Red clover (*Trifolium pratense*), lesser trefoil (*Trifolium dubium*), yellow-wort (*Blackstonia perfoliata*), cat's-ear (*Hypochaeris radicata*), yarrow (*Achillea millefolium*), red bartsia (*Odontites vernus*) and bird's-foot trefoil (*Lotus corniculatus*) were occasional. Other species occurring more rarely included bristly oxtongue, common figwort (*Schrophularia nodosa*) and eyebright (*Euphrasia officinalis* agg.)

Common cudweed is an annual species red-listed as vulnerable (Wyse-Jackson *et al.* 2016). A relevé survey (2x2m) conducted in May 2016 revealed the density of the common cudweed plants was approximately 55 plants per metre squared. Pale flax (*Linum bienne*) red-listed as near threatened (Wyse-Jackson *et al.,* 2016) was recorded in bare ground along the access track into the development site marginal to this area of exposed sand and gravel (ED1) where a few plants occurred.

Shrub species colonising the area included grey willow saplings (*Salix cinerea*), gorse (*Ulex europaeus*), silver birch (*Betula pendula*) and butterfly bush which were occasional throughout the area. A very small wet depression supported soft rush (*Juncus effusus*), compact rush (*Juncus conglomertaus*), jointed rush (*Juncus articulatus*) along with common bulrush (*Typha latifolia*), sea clubrush (*Bolboschoenus maritimus*), bur-reed (*Sparganium erectum*) and celery-leaved buttercup (*Ranunculus scleratus*). Field horsetail (*Equisetum arvense*) was abundant in an area of exposed sand on the western margin of the quarry pit. Moss species colonising the exposed ground surface included *Campylopus introflexus*, *Polytrichum juniperum*, *Dicranella varia* and *Calliergonella cuspidata* in damper areas.

Conservation evaluation: This habitat supported a high diversity of plant species in the local context including common cudweed and pale flax which are uncommon species in the locality and are red listed as vulnerable and near threatened respectively (Wyse-Jackson *et al*., 2016). The habitat is evaluated as of local importance (higher value).

Buildings and artificial surfaces (BL3)

There are three buildings on site. A small derelict cottage with the roof partly destroyed and two storage sheds. The buildings were checked for any signs of bat use and none were found. While it is possible that the buildings could be used as alternative temporary day roosts this is unlikely. The old cottage contained one old swallow nest. There is a concrete surface surrounding these buildings which is colonised by the more common ruderal species that are found in the exposed sand and gravel (ED1). The uncommon species common cudweed (*Filago vulgaris*) was not found in this area.

Conservation evaluation: A small area of artificial habitat with low potential to support bat or bird species this habitat is of negligible value.

Hedgerows (WL1) and treelines (WL2)


Hedgerow and scrub along the northern boundary

Hedgerows (WL1) delineate the boundary of the development site and that of the adjacent SAC and SPA on the northern and eastern side. The hedgerows are tall and unmanaged and are dominated either by gorse (*Ulex europaeus*) or hawthorn (*Crataegus monogyna*) and blackthorn (*Prunus spinosa*) with occasional sessile oak (*Quercus petraea*), elderberry (*Sambucus niger*) and holly (*Ilex aquifolium*). Bramble and bracken (*Pteridium aquilinum*) also occur in parts. Treelines (WL2) feature along the northern shoreline and along the railway line. Species include oak (*Quercus* sp.), alder (*Alnus glutinosa*), silver birch (*Betula pendula*) and ash (*Fraxinus excelsior*). The treelines provide connectivity to the wider landscape particularly along the rail line.

Hedgerows (WL1) also occur along some parts of the railway track south of the site. These hedgerows provide some linkage to hedgerows and gardens of the semi-urban and rural landscape of the surrounding area.

Conservation evaluation: Maintenance of a 10 m buffer from the high water mark is the target listed for otters in the conservation objectives for the Slaney Valley SAC. The hedgerows located along the boundary of the SAC are evaluated as of international importance as part of the SAC and as habitat for a local population of the Annex 1 species the otter which is listed as a qualifying interest of the Slaney valley SAC.

Elsewhere the hedgerows on site i.e. along the boundary with the rail line are evaluated as I local importance **(lower value)** being small areas of semi natural habitat in an urban context which are important habitat features for local populations of birds, bats, small mammal and other wildlife species.

Scrub (WS1)

Gorse scrub on the site

Areas of scrub occur along the margins of the site and the margins of the grassland areas, woodland and the disused quarry pit (the ED1 habitat). These areas are dominated by gorse or bramble (*Rubus fruticosus* agg.) with willow species also being frequent and other species occurring occasionally including ash (*Fraxinus excelsior*), sycamore (*Acer pseudoplatanus*), hawthorn, blackthorn and bracken. These areas of scrub (WS1) provide nesting and feeding habitat for passerine birds and cover for mammals such as hedgehog, pygmy shrew, wood mouse, rabbits and fox and also the common lizard.

Conservation evaluation: Areas of scrub located within 10 metres of the high water mark within the SAC boundary are evaluated as international value and are an important component of the otter habitat adjacent to the site. Other areas of scrub identified as being part of the otter habitat adjacent to the boundary of the SAC are evaluated as high local importance as habitat supporting a local population of the Annex 1 species the otter which is listed as a qualifying interest of the Slaney valley SAC.

The remaining areas of scrub habitat located within the central area of the site are valued as local importance (lower value) as habitat for a range of species including birds, small mammals and the common lizard.

Dry calcareous and neutral grassland (GS1)

There are very small areas of dry calcareous grassland (GS1). Grass species included frequent false oat-grass (*Arrhenatherum elatius*), cock's foot (*Dactylis glomeratus*), creeping bent (*Agrostis stolonifera*) and sweet vernal grass (*Anthoxantum odoratum*). Crested dog's-tail (*Cyanosaurus cristatus*) was occasional. Herb species present indicative of this habitat type included frequent wild carrot, ribwort plantain (*Plantago lanceolata*) and common bird's-foot trefoil (*Lotus corniculatus*) with occasional red clover, white clover (*Trifolium repens*), yellow-wort, common centaury, self-heal (*Prunella vulgaris*) and yarrow. Common knapweed (*Centaurea nigra*) and bush vetch (*Vicia sepium*) were rare. Moss species present in these grassland areas included *Rhytidiadelphus squarrosus and Kindbergia praelonga*.

Conservation evaluation: The extent of this semi-natural habitat is very small and is evaluated as negligible value.

Dry meadow (GS2)

There were four small areas of dry meadow grassland (GS2) totalling approximately 1.1 ha located in the north east of the development site, centre and adjacent to the woodland (WN2) to the west of the site. Lack of management or grazing of this habitat has produced a rank grassland. These grassland areas were composed of abundant false oat-grass with common bent (*Agrostis capillaris*), red fescue (*Festuca rubra*) and sweet vernal grass also present. Herb species included occasional ribwort plantain, bush vetch, tufted vetch (*Vicia cracca*), meadow vetchling (*Lathyrus pratensis*), lesser stitchwort (*Stellaria graminea*) and bindweed with common hogweed (*Heracleum sphondylium*) occurring rarely. Lack of management has resulted in the proliferation of grass species and limited the herb species diversity in this habitat. It nonetheless does provide some foraging and cover for a range of species groups including invertebrates, small mammals and birds.

Dry meadow grassland in the foreground and view of oak-ash-hazel woodland (outside site) in the background

Conservation evaluation: This habitat has been evaluated as of negligible value due to its limited plant species diversity and the small extent of the habitat.

Wet grassland GS4

A small area (0.15 ha) of species poor wet grassland occurs adjacent to the reed bed in the centre of the site. Indicative species included soft rush and silverweed (*Potentilla anserina*).

Conservation evaluation: Small area of semi-natural habitat of limited species diversity is evaluated as of negligible value.

Reed and large sedge swamp FS1

There is a small area (800m^2) of reed swamp (FS1) dominated by common reed (*Phragmites australis*) located adjacent to the northern boundary of the site. There was no standing water present in the reed bed at the time of survey in September and after heavy rain in December. The reed bed may have developed in a shallow depression in the land or borrow pit and the habitat appears to drying out.

Conservation evaluation: This habitat is of negligible value.

Wet willow-alder-ash woodland (WN6)

There is a small area (0.36 ha) of young wet woodland (WN6) surrounded by scrub (WS1) adjacent to the old quarry pit. This woodland is located in a shallow depression creating damp conditions. The canopy is composed of grey willow and silver birch. Holly and hawthorn are present in the sparse under storey. Ground flora included abundant ivy which also clads the trees. Bramble and great horsetail (*Equisetum telmateia*) were frequent. Species that occurred occasionally included soft shield fern, false wood brome, dandelion, hogweed and soft rush. Wild angelica (*Angelica sylvestris*), primrose (*Primula vulgaris*), wavy bitter-cress (*Cardamine flexuosa*), meadow buttercup, speedwell (*Veronica* sp.) and common dog-violet (*Viola riviniana*) occurred rarely. This woodland does not correspond to the Annex I woodland Alluvial Forests 91E0 as it is a flushed site and does not appear to be hydrologically linked to a water course and only two of the positive indicator species for that classification (*Angelica sylvestris* and *Urtica doicia*) were present in the woodland. The woodland does not meet the criteria for classification as Annex I Alluvial forest 91E0 which requires at least 6 positive indicators to be present (O'Neill & Barron, 2013).

Conservation evaluation: This woodland area provides nesting and foraging habitat for small birds and small mammals including bats. The ivy-clad trees have some potential as roosting sites for bats. It is evaluated as **of local value (lower value)** as a small area of semi-natural habitat that is of some local importance to wildlife.

Oak-ash-hazel woodland (WN2)

A small area (0.33 ha) of semi-natural woodland most closely affiliated to oak-ash-hazel woodland (WN2) occurs along the southern boundary of the site adjacent to the railway line. The woodland is a narrow linear feature with areas of dense scrub (WS1) occurring through it. The woodland is dominated by grey willow with some alder and birch (*Betula* sp.). Ground flora is characteristic of the dry earth bank including abundant ivy and bramble, with common hogweed and soft shield fern occasional.

Conservation evaluation: This woodland is evaluated as local value (lower value) as a small area of semi-natural habitat of some value to bird and bat species and affords some ecological connectivity to hedgerows in the wider area.

Pond FL8

There is a small pond in the north east corner of the development site. It is approximately 300 m^2 in area. Abundant sea rush (*Juncus maritimus*) is growing in the pond and indicates that the pond may be brackish. The pond probably developed in an excavation from the previous mining activities on site. It is not present on the historic 6" maps for the area. It is just visible on aerial photography captured in 2005 and 2000. Evidence of mining activity close to the pond is also visible on the maps.

Pond located in the northeast of the development site

Otter sprainting activity was frequent at the pond and it is thought that the pond is used as a source of freshwater for otters to wash their coats.

The pond is quite stagnant with poor aquatic plant diversity with only one aquatic plant present thought to be fennel pondweed (*Potomogeton pectinatus*) present along with algae. There is a strong odour of decomposition on sampling and black decomposed material present at the bottom of the pond. Pond dipping to sample the invertebrate fauna revealed a very low diversity with only *Gammarus sp.* present in the substrate and pond skaters (Gerridae) observed on the surface of the water.

Conservation evaluation: The pond is an important component of the otter habitat likely to be used by otter for washing their coats. The pond is evaluated as of high local importance due to its importance as a component of the habitat supporting a local population of the Annex I species the otter.

6.3.5 Adjacent habitats

Oak-ash-hazel woodland (WN2)

There is an area of oak-ash-hazel woodland located adjacent to the western boundary of the development site and adjacent to the shoreline and included within the boundary of the SAC. The woodland appears to be above the zone of inundation. There is a drain (FW4) and earth bank (BL2) at the southern boundary of the woodland. After heavy rains in January, a small stream (FW2) ran through the woodland. This stream was not evident during surveys in the drier period in September.

The woodland is most closely affiliated to oak-ash-hazel woodland (WN2). The woodland is composed of a mature canopy of sessile oak (*Quercus petraea*) with hazel (*Corylus avellana*), willow (*Salix* sp.) and holly (*Ilex aquifolium*) in the understorey. Bramble and common ivy were abundant in the ground flora. False brome (*Brachypodium sylvatica*) was frequent. Also present were bluebell, remote sedge (*Carex remota*) and dog violet (*Viola* sp.). Ferns present included bracken, scaly male fern (*Dryopteris affinis*), soft shield fern and broad buckler fern (*Dryopteris dilatata*). Great horsetail (*Equisetum telmateia*) was occasional in the ground flora. Mosses present in the ground flora included *Dichodontium palustre*, *Eurhynchium striatum*, *Brachythecium rutabulum* with a *Hypnum* species present on the tree trunks.

Oak-ash hazel woodland (WN2) is not an annexed habitat. However this woodland type is very limited in extent in Ireland and should be regarded as being of conservation importance.

Conservation evaluation: International importance as it lies within the boundary of the SAC and SPA.

Reed and large sedge swamp FS1

There is a small reed bed (FS1) dominated by common reed (*Phragmites australis*) located adjacent to the southeast corner of the site within the boundary of the SAC.

Conservation evaluation: International importance as part of the SAC and SPA.

Shingle and gravel shores (LS1), sand shores (LS2) / Annual vegetation of drift lines (1210)

Shingle and gravel shores (LS1) occur adjacent to the northern and eastern boundaries of the development site. Strandline vegetation is sparse and includes species such as many-seeded goosefoot (*Chenopodium polyspermum*), sea beet (*Beta vulgaris*), sea aster (*Tripolium pannonicum*), spear-leaved orache (*Atriplex prostrata*), sea milkwort (*Lysimachia maritima*), sea plantain (*Plantago maritima),* thrift (***Armeria maritima)*** and annual sea blite (*Sueda maritima*). Seaweed covering the shoreline included *Fucus vesiculosus* and *Ascophyllum nodosum*.

Sand shores (LS2) occur adjacent to the northeastern tip of the proposed development site. There is no vegetation on the sand shore but strandline vegetation here consists of frequent sea beet, sea campion (*Silene uniflora*) and spear-leaved orache with occasional lyme grass (Leymus arenarius).

Shingle and gravel shores/ sand shores may contain examples of the Annex I habitat 'Annual vegetation of drift lines' (1210).

Conservation evaluation: International importance as the habitat lies within the boundary of the SAC and SPA.

Mud shores (LS4)/ Annex I Tidal mudflats (1140)

To the north and east of the development site mud shores (LS4) occur which are covered by water at high tide. This habitat corresponds to the Annex I habitat Mudflats and sand flats not covered by sea water at high tide (1140)**.** The community complex present is estuarine muds dominated by polychaetes and crustaceans (NPWS 2011c).

Conservation evaluation: International importance as an area of Annex I habitat which is a qualifying interest for the Slaney valley SAC and part of the Wexford Harbour SPA.

Estuary (MW4)/ Annex I Estuaries (1130).

The estuary corresponds to the Annex I habitat Estuaries (1130). The estuary habitat of the Natura site extends from the inner Wexford Harbour area north to Enniscorthy (NPWS 2011c).

Conservation evaluation: International importance as an area of Annex I habitat which is a qualifying interest for the Slaney valley SAC and part of the Wexford Harbour SPA.

Saltmarsh

An area of saltmarsh (CM) occurs south of the rail line. This area was not surveyed in detail but is likely to be predominantly upper saltmarsh (CM2). The saltmarsh monitoring project 2007-2008 identified some areas of the saltmarsh as potential Annex I Atlantic Salt marsh (1330). The area was not subject to field survey during that monitoring project and the habitat was identified from desktop review only.

A very small area of saltmarsh (not mapped) is located to the east of the reed bed just north of the rail line.

Conservation evaluation: County importance as an area of potential Annex I habitat that does not fulfil the criteria for valuation as of international or national status.

Amenity grassland (GA2)

The sports grounds are composed mostly of amenity grassland (GA2) with areas of buildings and artificial surfaces (BL3). There are also some embankments which are composed of regenerating bare ground (ED3). These were not mapped separately. The amenity grassland (GA2) provides feeding areas for birds such as starlings and rooks in the predominantly urban environment. A small area of dry calcareous grassland has developed on the embankment of the access road to the sport courts south of the site.

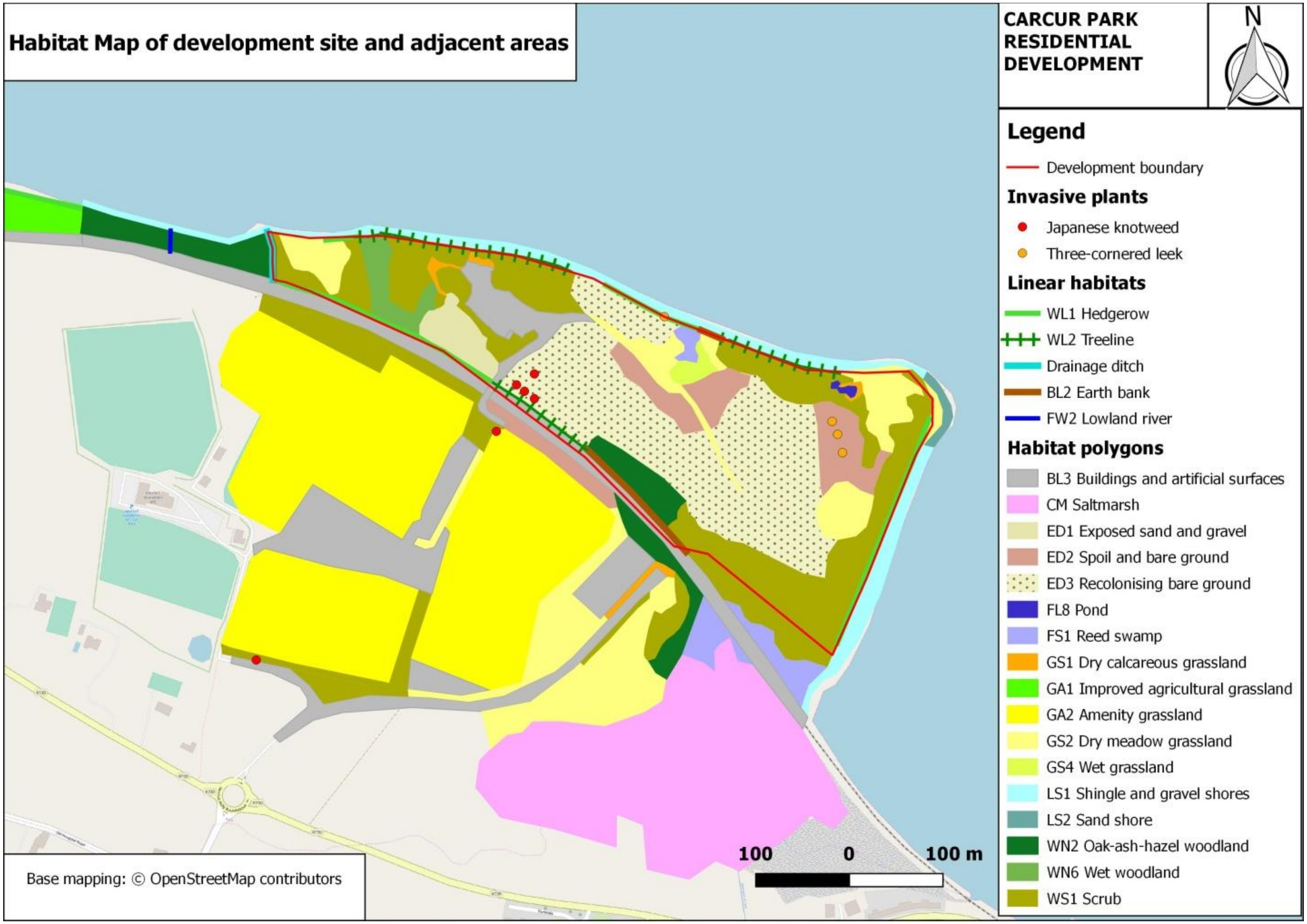
Conservation evaluation: This habitat is of negligible ecological value.

Improved agricultural grassland (GA1)

Improved agricultural (GA1) grassland occurs to the west of the oak ash hazel woodland (WN2).

Conservation evaluation: Improved agricultural grassland provides limited foraging areas for wildlife e.g. for common birds such as starlings and rooks. This habitat is of negligible ecological value.

Figure 6.4. Habitat Map of the development site at Carcur



6.3.6 Notable flora

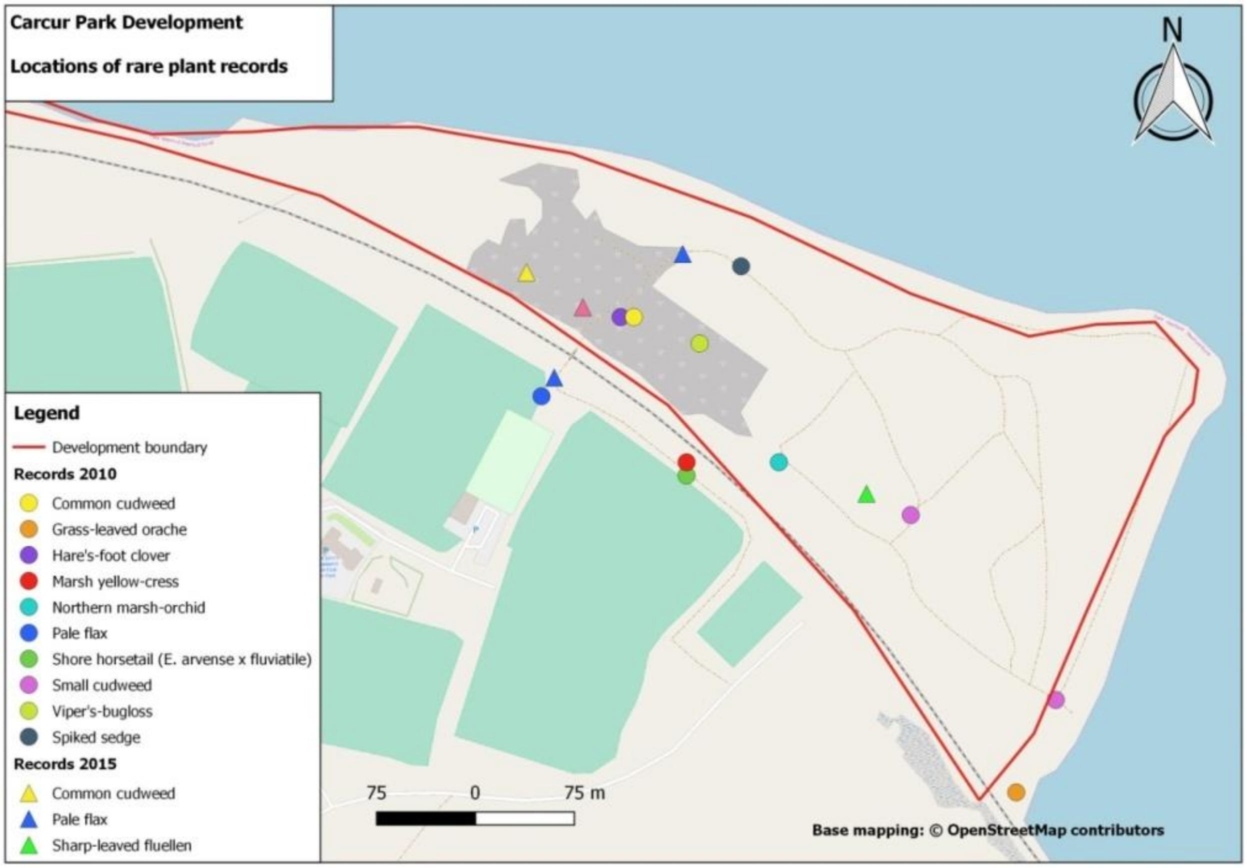
Records (1 km^2) from the National Biodiversity Data Centre indicate that one protected flora species was recorded from the site in 2010: Small cudweed (*Filago minima*). This species is protected under the Flora Protection Order (2015) and listed in the Vascular Plant Red List (2016) as Near Threatened.

Grid references for the species records from the site were obtained from the recorder Mr Paul Green, BSBI Vice County for Wexford. Despite a thorough search for the species, it could not be relocated in 2015. The plant was previously recorded along paths through scrub and it is likely that it has been encroached upon and outcompeted.

In addition, there were several regionally rare and/or uncommon plant species recorded on the development site in 2010 by Paul Green including spiked sedge (*Carex spicata*), northern marsh orchid (*Dactylhoriza purpurella*), viper's bugloss (*Echium vulgare)*, common cudweed (*Filago vulgaris*), hare's-foot clover (*Trifolium arvense*), and the non-native sharp-leaved fluellen (*Kickxia elatine*). Two of these species common cudweed and sharp-leaved fluellen were re-located during ecological field surveys in September 2015 and April 2016. One specimen of sharp-leaved fluellen was recorded in the centre of the site growing on one of the spoil heaps. This species is categorised in the Vascular Plant Red List (Wyse-Jackson et al., 2016) as Least Concern. This species is more common in Wexford than nationally. Common cudweed (*Filago vulgaris*) was frequent in the disused gravel pit in exposed sand and gravel (ED1) habitat to the west of the existing access track. This species is uncommon nationally but relatively more common in Co. Wexford (Paul Green pers. comm.). It is categorized in the Vascular Plant Red List (Wyse-Jackson *et al*., 2016) as vulnerable due to a decline in area of occupancy. Despite a targeted search aided by grid references for the previous records, the other species listed above were not relocated during these surveys.

Several other species including marsh yellow-cress (*Rorippa palustris),* pale flax (*Linum bienne*) and shore horsetail (*Equisetum x littorale*) were previously recorded in 2010 adjacent to the site near the railway track and grass-leaved orache (*Atriplex littoralis)* was recorded on the eastern shoreline. Pale flax was relocated in 2016 on the existing access track into the site adjacent to the railway bridge and on site. (Note: the access track is mapped as artificial surfaces but marginal small areas were bare ground where pale flax occurred). Pale flax is categorised as Near Threatened in the Vascular Plant Red list (2016) due to a decline in area of occupancy. Another rare species small-flowered catchfly (*Silene gallica*) was last recorded from the 1 km square (T0323) in 1990. The locations of these plant species records are depicted in Figure 6.5. Conservation evaluation of these plant species are detailed in Table 6.1 below.

Figure 6.5. Location of notable plant species previously recorded in 2010 by Paul Green and in 2015/16



6.3.7 Flora evaluation

With regard to the notable flora that has been confirmed to still occur on the site (i.e. sharp-leaved fluellen, common cudweed and pale flax) the flora is evaluated as being of local importance (higher value) due to the presence of common cudweed and pale flax that are red listed as vulnerable and near threatened respectively but for which there are more records in the south east then nationally. Common cudweed has been recorded in seventeen 10-km squares in the county and at eighteen sites in the 10-km square in which Carcur lies. Pale flax has been recorded in seventeen 10-km squares in the county with 22 records (post 2000) for the 10 km (T02) square in which Carcur lies. Sharp-leaved fluellen is listed as a species of least concern on the Red List for Vascular Plants and has been recorded in nineteen 10-km squares in the county (post 2000). The record at Carcur is one of 9 records for the species in the 10 km square (T02) in which the site lies (post 2000). Sharp-leaved fluellen is a species that is more common in Wexford than in any other county in Ireland (Paul Green per. comm.).

Should the other more rare species occur on site, in particular spiked sedge, then the flora evaluation would be elevated to be of county importance however this evaluation has not been assigned as it is considered unlikely that these species still occur there as spiked sedge could not be relocated despite a thorough search in April 2016 of the area where it was previously recorded. Viper's bugloss, hare's foot clover and red sand spurrey are species that tend to "come and go" as the habitats change over the years (Paul Green personal communication).

The protected species small cudweed was previously recorded at two locations on the development site. These areas were thoroughly searched during surveys in in April and May 2016 and the species was not found. One of these areas was noted to be threatened by scrub encroachment by Paul Green at the time of recording in 2010 and the other was in the disused sand pit which is now overgrown with almost 100% plant cover including highly competitive species such as thistles. It is therefore considered that small cudweed is very unlikely to still be present on the site.

Several of the species listed above were recorded adjacent to the site and not within the footprint of the development. In addition, small flowered catchfly (*Silene gallica*) and red sand-spurrey (*Spergularia rubra*) have not been recorded there since 1990 and may be lost from the site. It should also be noted that most of these species are annuals or biennials (with the exception of spiked sedge, shore horsetail and northern marsh orchid) which thrive in bare and/or recently disturbed ground. As annuals or biennials they are vulnerable to changes in growth conditions locally at the site e.g. being outcompeted by more vigorous grass or scrub species.

Table 6.1 Rare and protected flora from 1 km square records							
Species	**Common name**	**Red list 2016**	**Occurrence in County Wexford (records post 2000)**		**Date of last record on/adjacent to site**	**Evaluation**	**Comment**
			No. of 10-km squares in county	**No. of tetrads (2 km^2)**			
Carex spicata	**Spiked sedge**	**NT**	**2**	**2**	**2010**	**County**	**Nationally scarce and rare in Wexford**
Dactlyorhiza purpurella	**Northern marsh orchid**	**LC**	**12**	**14**	**2010**	**County**	**Rare in Wexford, more common nationally**
Echium vulgare	**Viper's bugloss**	**LC**	**5**	**7**	**2010**	**County**	**Rare in County Wexford**
Filago minima	**Small cudweed**	**NT**	**11**	**18**	**2010**	**County**	**Wexford stronghold for species. Protected species (FPO 2015)**
Filago vulgaris	**Common cudweed**	**VU**	**17**	**30**	**2015**	**High local**	**Relatively common in Wexford**
Kickxia elatine	**Sharp-leaved fluellen**	**LC**	**19**	**73**	**2015**	**High local**	**More common in Wexford than nationally only one plant found on site**

Table 6.1 Rare and protected flora from 1 km square records							
Species	**Common name**	**Red list 2016**	**Occurrence in County Wexford (records post 2000)**		**Date of last record on/adjacent to site**	**Evaluation**	**Comment**
Linum bienne	**Pale flax**	**NT**	**17**	**56**	**2016**	**High local**	**More common in the southeast than nationally**
Trifolium arvense	**Hare's foot clover**	**LC**	**8**	**19**	**2010**	**High local**	**Rare in county**
Silene gallica*	**Small-flowered catchfly**	**VU**	**4**	**6**	**1990**	**County**	**Rare in county**
Spergularia rubra	**Red sand spurrey**	**LC**	**4**	**6**	**1990**	**County**	**Rare in county**
Atriplex littoralis	**Grass-leaved orache**	**LC**	**9**	**19**	**2010**	**High local**	**Rare in county**
Equisetum x littorale	**Shore horsetail**	**Not listed**	**6**	**7**	**2010**	**High local**	**Under recorded**
Rorippa palustris	**Marsh yellow-cress**	**LC**	**6**	**11**	**2010**	**County**	**Rare in county**

*Introduced species according to Parnell and Curtis Webb's An Irish Flora

NT: Taxa are assessed as Near Threatened on the basis of an observed past or suspected future population reduction of 20–29% based on decline in Area of Occupancy or habitat quality. VU: A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.

6.3.8 Invasive plant species

A stand of Japanese knotweed (*Fallopia japonica*) is located growing along the hedgerow bordering the railway line and spreading into the site. The Japanese knotweed extends for about 30m along the hedgerow. Another clump of Japanese knotweed is located adjacent to the site at the entrance to the GAA field from the railway tracks.

Three-cornered leek in disturbed bare ground

Three-cornered leek (*Alium triquetrum*) was also recorded on site. It is located along the earth bank (BL2) on the northern boundary of the site and frequent throughout an area of disturbed ground in the centre of the site towards the eastern boundary.

Japanese knotweed and three-cornered leek are non-native invasive plant species listed on Schedule 3 of the EU Birds and Habitat Regulations 2011 and subject to restrictions under Regulations 49 and 50. Under regulation 49 it is an offence (except in accordance with a licence) to plant, disperse, allow or cause to disperse, spread or otherwise cause to grow in any place species listed on Schedule 3. The location of Japanese knotweed and three-cornered leek are shown in Fig. 6.4 Habitat Map

Three other species considered to be invasive (but not subject to legal control) were recorded on site including butterfly bush (*Buddleia davidii*), old man's beard (*Clematis vitalba*) and winter heliotrope (*Petasites fragrans*).

6.3.9 Fauna

Mammals

Records of mammals recorded for the 10 km square T02 in the NBDC database are presented in Table 6.2. No additional records of mammals were present in the NPWS rare and threatened species database.

Badger have been recorded in the 10 km square in which the site lies. There was no evidence of badger present on the development site. No badger droppings, tracks or setts were found on the site. The site does not present as suitable habitat for the badger as the connectivity to the wider landscape for foraging is minimal and there is ample more suitable landscape available to badgers in the rural hinterland of Wexford town.

The site is unlikely to be suitable habitat for pine marten as the extent of the woodland is very small. No signs of red squirrel were recorded on site. Although possibly an occasional visitor, the red squirrel is unlikely to occur on site as the only suitable habitat present on site is the mature woodland at the western boundary and this is very small in extent.

The site however does provide suitable habitat for some protected mammal species including otter, hedgehog, hare, pygmy shrew and bat species and these mammals are discussed further in the sections below.

Table 6.2 Mammals records 10 km square (NBDC records)			
Scientific name	**Common name**	**Date of record**	**Legal Protection**
Halichoerus grypus	Grey Seal[1]	31/08/2014	EU Habitats Directive Annex II, V Wildlife Acts
Phoca vitulina	Common Seal[6]	19/08/2003	EU Habitats Directive Annex II, V Wildlife Acts
Apodemus sylvaticus	Wood Mouse[1]	27/12/2015	
Erinaceus europaeus	Hedgehog[1]	11/10/2015	Wildlife Acts
Lepus timidus subsp. hibernicus	Irish Hare[1]	10/01/2016	EU Directive Annex V Wildlife Acts
Lutra lutra	Otter[1]	14/10/2013	EU Habitats Directive Annex II IV Wildlife Acts
Martes martes	Pine Marten[1]	27/05/2015	EU Habitats Directive Annex V Wildlife Acts
Meles meles	Badger[1]	26/02/2013	Wildlife Acts
Mus musculus	House Mouse[1]	24/11/2015	
Mustela erminea subsp. hibernica	Irish Stoat[1]	05/10/2014	Wildlife Acts
Mustela furo	Feral Ferret[2]	22/08/2011	
Mustela vison	American Mink[1]	26/05/2015	
Myotis daubentonii	Daubenton's Bat[3]	27/08/2014	EU Habitats Directive Annex IV Wildlife Acts
Myotis nattereri	Natterer's Bat[3]	06/06/1999	EU Habitats Directive Annex IV Wildlife Acts
Nyctalus leisleri	Lesser Noctule[3]	02/08/2012	EU Habitats Directive Annex IV Wildlife Acts
Oryctolagus cuniculus	Rabbit[1]	13/01/2016	
Pipistrellus pipistrellus sensu lato	Pipistrelle[4]	21/05/2011	EU Habitats Directive Annex IV Wildlife Acts
Pipistrellus pygmaeus	Soprano Pipistrelle[3]	21/09/2011	EU Habitats Directive Annex IV Wildlife Acts

Table 6.2 Mammals records 10 km square (NBDC records)			
Scientific name	**Common name**	**Date of record**	**Legal Protection**
Plecotus auritus	Brown Long-eared Bat[3]	21/09/2011	EU Habitats Directive Annex IV Wildlife Acts
Rattus norvegicus	Brown Rat[1]	11/01/2016	
Sciurus carolinensis	Grey Squirrel[1]	11/10/2015	
Sciurus vulgaris	Red Squirrel[5]	31/12/2007	Protected Species: Wildlife Acts
Sorex minutus	Pygmy Shrew[1]	01/08/2014	Protected Species: Wildlife Acts
Vulpes vulpes	Red Fox[1]	07/09/2015	

[1] Data from Atlas of Mammals in Ireland held by the National Biodiversity Centre
[2] Data from National Feral Ferret Database held by the National Biodiversity Centre
[3] Data from National Bat Database held by the National Biodiversity Centre
[4] Data from Ireland's Bioblitz held by the National Biodiversity Centre
[5] Data from The Irish Squirrel Survey 2007 held by the National Biodiversity Centre
[6] Data from NPWS seal database held by the National Biodiversity Centre

Bats

Bats are protected by law in the Republic of Ireland under the Wildlife Acts. For all bats it is an offence to disturb, injure or kill bats or disturb or destroy their roosts. In addition, bats are also protected under the EU Habitats Directive (92/43/EEC). The lesser horseshoe bat which is found in the Republic of Ireland only is listed in Annex II of the EU Habitats Directive, while all bat species are listed in Annex IV of the same directive. The EU Habitats Directive has been transposed into Irish law with the European Communities (Birds and Natural Habitats) Regulations 2011. The level of protection offered to lesser horseshoe bats means that areas important for this species are designated as Special Areas of Conservation. For remaining bats, the EU requires that they are strictly protected. Under the Habitats Directive Ireland is obliged to 'maintain favourable conservation status' of Annex-listed species.

Bats are likely to use the boundary treelines, hedgerows and woodland habitat on and adjacent to the site for foraging and commuting. Bats may also feed over the grasslands and recolonising bare ground (ED3) habitat within the site. There is potential for bats to roost in the more mature trees present in the woodland adjacent to the western boundary of the site. Trees on site were generally immature or young trees and had low potential to support bat roosts. Bats could also potentially roost in the bridge over the rail line adjacent to the site. The two buildings on site have low potential as roost sites. These buildings were checked visually for signs of bats in November 2015. There were no signs of staining, droppings or feeding remains in the buildings. It is possible they could be used as temporary alternative roost sites.

Review of the bat suitability index maps available on the NBDC maps indicates that the 10 km square within which the development site is located has a suitability index of 38.56 for all bats.

The index ranges from 0 to 100 indicating the suitability of the area for bat species. The predictions of Suitability Distribution models (SDM) are based on estimating the suitability of an area for a species using correlations with environmental variables. However, the suitability of an area is not related to the availability of habitat at any one given location but to the context of the surrounding landscape habitat structure, size and shape.

For individual species the 10 km square indicates a suitability in the range of 30-53 for all bat species except lesser horseshoe bat and Nathusius' pipistrelle. The range of lesser horseshoe bat is restricted to western counties in Ireland and Nathusius' pipiestrelle is a relatively recent addition to the Irish fauna increasing its range from Northern Ireland but the extent of its range in Ireland at present is unknown.

Review of the NBDC data base for bat species indicate there are records for Daubenton's bat (2014), Natterer's bat (1999), Leisler's bat (2012), common and soprano pipiestrelles (2011) and long-eared bat (2011) within the 10-km square in which the site lies..

Review of Bat Conservation Ireland's bat record maps indicates that the most likely species to occur include the common pipistrelle and soprano pipistrelle as these are common and widely distributed in County Wexford and are the most common species in urban and rural habitats. Both pipistrelle species are very general in their habitat preferences foraging in woodland, riparian habitats, parkland and along linear features in farmland. Maternity roosts are often found in buildings, although they also roost in other locations such as tree holes and bridges. Both pipistrelle species are thought to hibernate in buildings in winter and soprano pipistrelles may roost in trees. Trends in these species are monitored annually using the car-based bat monitoring scheme. Results from this scheme indicate that since 2003 the soprano pipistrelle has increased significantly while the common pipistrelle has also increased, albeit more slowly. The reasons for these increases are poorly understood but both species may be recovering from past declines, or responding to increased woodland cover and/or climate change. (www.batconservationireland.org/irish-bats/species/common-and-soprano-pipistrelle).

There is also potential for Leisler's bat and long-eared bat to forage in the area as these species are also quite widely distributed in the county. Surveys and modelling of the foraging preference of Leisler's bat indicate that woodlands, riparian habitats and small amounts of urbanisation are favoured but areas of dense urbanisation are avoided (NPWS, 2013). Leisler's bat most commonly roosts in buildings although about 13% of its roosts are found in trees. The annual trend of Leisler's bat has shown significant increases since 2003.

The brown long-eared bat roosts in buildings such as houses with large attic spaces, churches, outbuildings and in tree holes. Modelling indicates that brown long eared bats select areas with broadleaf woodland for foraging and riparian habitats at a local scale. It can cope with low levels of urbanisation (NPWS, 2013). Results from the brown long-eared bat roost monitoring scheme indicates that thus far its population has been stable.

Daubenton's bat may occur close to the site as this species is strongly associated with rivers and lakes however it is less likely to be present where there are street lights (NPWS, 2013). Daubenton's bats roost under stone bridges, in ruins, canal tunnels, trees and damp caves. The population is stable and there is no indication of any major pressures currently impacting on the species.

The conservation of all bat species apart from Nathusius' pipistrelle in Ireland was assessed as favourable in the latest Article 17 assessment of the conservation status of habitats and species in Ireland (NPWS, 2013). The conservation status of Nathusius' pipistrelle is unknown due to lack of data.

Conservation evaluation: The bat population predicted for the site is evaluated as of local importance (lower value) based on the presence of small areas of suitable habitat for foraging and commuting and low potential for bat roosts.

Irish Hare (*Lepidus timudus hibernicus*)

It is possible but unlikely that hare occur on the site as the grassland areas are very limited in extent and there is more suitable habitat in the surrounding farmland. Density estimates show that hares in Ireland are more abundant in lowland farmland habitat and populations can be affected by changes in agricultural practices. Currently the conservation of Irish hare is considered favourable in the latest article 17 assessment on the conservation of habitats and species (NPWS 2013).

Hedgehog, Pygmy shrew and Stoat

The site presents suitable habitat for hedgehogs, pygmy shrews and stoats. Hedgehogs (*Erinaceus europaeus*) are listed as least concern in the current red list for mammals (Marnell, 2009). Hedgehogs are present in all lowland habitats where there is sufficient food and cover for nesting (Harris & Yalden, 2008). The hedgehog is most abundant where grassland meets woodland or scrub and they are common in suburban areas (Marnell, 2009). They are scarce in coniferous woods, marsh and bog and areas of intensive agriculture. Hedgehogs are primarily nocturnal and solitary. Populations can fluctuate from year to year depending on food availability. Hedgehogs are vulnerable to pesticides used in gardens and many are killed by eating poisoned slugs. Severe winters may kill hibernating hedgehogs. Many hedgehogs are killed on roads although these incidents tend to be most frequent when hedgehog population densities are high and road-kill is probably not a factor controlling populations (Marnell, 2009).

Pygmy shrew is listed as least concern in the current Red List No. 3 for Terrestrial mammals (Marnell, 2009). No detailed, systematic survey of this shrew has taken place in Ireland, but the species would appear to be common and widespread in Ireland wherever the habitat is suitable. The shrew occurs in a wide variety of habitats, from dunes and farmland to upland and wetland. In all habitats it requires a rich plant cover and a supply of invertebrates. The species reliance on insect prey makes its vulnerable to heavy use of pesticides. Its main predators are foxes and owls. The impact of the recently introduced greater white-toothed shrew (*Crocidura russula*) has yet to be established.

The stoat is widely distributed in Ireland recorded in every county. It is a solitary, territorial species and found in wide variety of habitats from coastal grasslands to woodlands and uplands. It tends to avoid open habitats, travelling along hedgerows and stone walls. The stoat is listed as least concern in the current red list for mammals (Marnell, 2009).

Conservation evaluation: The populations of these protected mammal species predicted to occur on site are evaluated as of local importance (lower value) given that these mammal species are predicted to be common and widespread in the locality.

Other mammals

Other mammals expected or known to occur on the site include the fox, wood mouse and the non-native species rabbit and brown rat. These species are not protected in Ireland but are important components of ecosystems and local biodiversity.

The fox is widespread throughout Ireland and found in all counties. An opportunist, typically found in woodland habitat and grassland areas, but with increasing presence in urban areas. A fox was recorded on site during ecological surveys for this development in 2015 and the fox is expected to make frequent use of the site and to be resident.

The wood mouse is ubiquitous in Ireland including many offshore islands. While there is no population estimate available for Ireland, there is no evidence of a population decline. Wood mice are mainly nocturnal and inhabit dry woodland and most other dry habitats across the whole of the island. They also tend to have a higher density association with pastoral farmland.

Rabbit burrows are noted throughout the site in the grassy banks and scrub habitat. The brown rat was also recorded on site. All these species are listed as least concern under the current red list for mammals (Marnell 2009).

Conservation evaluation: The populations of these unprotected and/or introduced species are evaluated as of local importance (lower value).

Waterbirds

The full results of the analyses of the existing waterbird data and the waterbird counts carried out for this assessment are presented in Appendix 6.3. The following is a summary of the main findings.

The Wexford Harbour and Slobs SPA and the Raven SPA have been designated for their populations of 32 species of birds, which are referred to as Special Conservation Interests (SCIs) of the SPAs. In addition to these species, there are a number of other waterbird species that have significant wintering populations in the Wexford Harbour and Slobs SPA and the Raven SPA.

For the purposes of waterbird monitoring Wexford Harbour and Slobs SPA and the Raven SPA have been combined into a single site: Wexford Bay. This site does not include the section of the Wexford Harbour and Slobs SPA upstream of Ferrycarrig Bridge. The Wexford Bay site is divided into a number of subsites. It should be noted that the subsites do not include the middle of the main harbour and areas of sandbank at the mouth of the harbour are not covered by the subsites. Therefore, waterbird counts for Wexford Bay will tend to underestimate the total numbers that occur in the harbour. One of the subsites covers the area between Wexford Bridge and Ferrycarrig Bridge (the Ferrycarrig subsite) and includes the area adjacent to the proposed development site.

The extent of intertidal habitat shown in Ordnance Survey mapping of Wexford Harbour, and used by NPWS in mapping for their conservation objectives, is based on historical data and bears no relationship to the current situation. The typical extent of intertidal habitat exposed at low tide on a moderate spring tide in the Ferrycarrig subsite is shown in Figure 6.2. This is based on mapping of tidal exposure during the 2015/16 waterbird surveys and aerial imagery. The most extensive area of intertidal habitat is in S10 and S11 at the northern end of the subsite. Other significant areas of intertidal mudflat are regularly exposed in S1, S6 and S8. In S2, S3, S5, S6, S7 and S12 intertidal mudflat tends to only be exposed on the lower tides. The other sectors (S4, S9 and S13) hold shingle shorelines with minimal exposure of intertidal mudflats at low tide.

The 2009/10 waterbird survey programme (WSP) included four low tide counts and one high tide count of Wexford Bay. The numbers of waterbirds recorded in the Ferrycarrig subsite during the 2009/10 WSP low tide counts are compared with the total Wexford Bay count in Table 6.3. The species that occurred in relatively high numbers in the Ferrycarrig subsite during the low tide counts included goldeneye, black-tailed godwit, greenshank and redshank. During the single high tide count (21/01/2010), only six species were recorded in the Ferrycarrig subsite, with a total of 24 counted across all these species. Mapping of high tide roosts by NPWS (2011) shows four high tide roosts within the Ferrycarrig subsite, all located along the northern/eastern shore of the subsite. The species listed as using these roosts are mallard, little egret, oystercatcher, black-tailed godwit, curlew and black-headed gull. No information is provided on the size of these roosts. Observations during the waterbird counts carried out for this assessment indicated that most waders move out of the subsite to roost in the main harbour at high tide.

The survey work carried out for this assessment included eight low tide counts of the Ferrycarrig subsite between September 2015 and January 2016. Across all these low tide counts, 21 of the 32 SCI species of the Wexford Harbour and Slobs SPA and the Raven SPA were recorded in the study area (Table 6.3). The SCI species that were not recorded included species that mainly occur offshore in the Raven SPA (common scoter and red-throated diver) species that mainly occur on the slobs (Bewick's swan, whooper swan, Greenland white-fronted goose, pintail and coot), one species that is now rather rare in Wexford Harbour (scaup), a raptor (hen harrier), a wader associated with more sandy sediments (sanderling), and a breeding tern species (little tern). Somewhat more surprising were the absence of any records of the remaining two SCI species: light-bellied brent goose and golden plover. However, neither of these species was recorded in the Ferrycarrig subsite during the 2009/10 WSP counts.

Another 15 non-SCI waterbird species were recorded during the 2015/16 low tide counts. Of these, little egret, greenshank, common gull, herring gull and great black-backed gull were regularly recorded.

Across all counts the following SCI species were recorded in the sectors adjoining the development site: shelduck, mallard, red-breasted merganser, cormorant, grey heron, little grebe, oystercatcher, lapwing, curlew, black-tailed godwit, bar-tailed godwit, redshank, black-headed gull, and lesser black-backed gull (Appendix 6.3). A further nine non-SCI species were also recorded: cormorant, little egret, turnstone, spotted redshank, greenshank, sandwich tern, common gull, herring gull and great black-backed gull (Appendix 6.3). The species that occurred regularly (i.e., on 50% or more of the low tide counts) were: cormorant, little egret, grey heron, little grebe, oystercatcher, curlew, black-tailed godwit, greenshank, redshank, black-headed gull, herring gull and great black-backed gull. Across all the regularly occurring species there was a general pattern of more regular occurrence, and higher numbers, at low tide compared to the ebb/flood and high tides. Most species also occurred more regularly, and in higher numbers, on the ebb/flood tide compared to at high tide.

The most important areas of low tide habitat in the sectors adjoining the development site are the mudflats in S3 and S6, with the latter area extending into S5 on low spring tides. The gravel spit at the eastern end of S5 can hold small concentrations of waterbirds and may be used as a resting area by flocks moving through the estuary. Small high tide roosts of oystercatcher, greenshank and redshank occur irregularly along the railway line in S3 (about 100-200 m east of the eastern side of the development site) and on the shingle bank at the southern end of S4.

The relative importance of the sectors (S3-S6) adjoining the development site for the regularly occurring species was assessed by calculating the mean percentage of the total Ferrycarrig low tide counts that occurred within these sectors. For most of these species, the sectors held around 15-30% of the total subsite count Table 6.3). However, only 2-3% of the black-tailed godwit and curlew counts occurred within these sectors. If the overall distribution of waterbirds during the 2009/10 low tide counts is considered representative, then these sectors may hold 0-5% of the total Wexford Bay population of these species, while Sectors S4-S5 (the sectors directly adjacent to the development site), may hold 0.1-2.2% of the total Wexford Bay population of these species (Appendix 6.3). As the 2009/10 low tide counts probably underestimated numbers in the outer part of Wexford Bay (see above), the above percentages may be overestimates.

Table 6.3 - Waterbird counts for the Ferrycarrig subsite (0O407) during the 2009/10 and 2015/16 low tide counts[a]

	2009/10 low tide counts		2015/16 low tide counts	
	Ferrycarrig subsite		Ferrycarrig subsite	S3-S6
Species	mean count	mean % of Wexford Bay total	mean count	mean % of Ferrycarrig total
Shelduck	5	1%	1	-
Wigeon	0	0%	< 1	-
Teal	1	1%	6	-
Mallard	0	0%	46	-
Goldeneye	7	36%	14	-
Red-breasted merganser	4	5%	4	-
Little grebe	0	0%	8	-
Great crested grebe	14	19%	6	-
Cormorant	10	4%	23	15%
Little egret	4	10%	15	27%

Table 6.3 - Waterbird counts for the Ferrycarrig subsite (0O407) during the 2009/10 and 2015/16 low tide counts[a]				
	2009/10 low tide counts		2015/16 low tide counts	
	Ferrycarrig subsite		Ferrycarrig subsite	S3-S6
Species	mean count	mean % of Wexford Bay total	mean count	mean % of Ferrycarrig total
Grey heron	3	12%	16	21%
Oystercatcher	34	8%	81	17%
Grey plover	2	1%	4	-
Lapwing	321	10%	153	-
Knot	0	0%	167	-
Dunlin	1	0%	416	-
Black-tailed godwit	233	34%	1053	2%
Bar-tailed godwit	5	1%	33	-
Curlew	59	7%	81	4%
Greenshank	4	29%	10	18%
Redshank	156	23%	181	15%
Black-headed gull	356	12%	778	10%
Common gull	1	0%	5	8%
Lesser black-backed gull	6	8%	7	30%
Herring gull	2	2%	9	21%
Great black-backed gull	1	1%	5	32%

[a] Table 6.3 includes all SCI species and the regularly occurring non-SCI species. For data on the additional non-SCI species recorded, see Appendix 6.3. The mean % of the Ferrycarrig total in S3-S6 is only shown for the species that regularly occurred in those sectors.
Data source for the 2009/10 low tide counts: 2009/10 Waterbird Survey Programme as undertaken by the National Parks & Wildlife Service.

Birds within the development site

This section describes the bird species recorded within the development site (i.e., excluding species recorded in the adjacent shoreline and estuary) during the waterbird survey, and assesses the potential breeding bird population of the development site based on the habitat characteristics of the site.

A total of 32 bird species were recorded within the development site on the waterbird survey visits between September 2015 and January 2016. These included one species (meadow pipit) that is red-listed in Birds of Conservation Concern in Ireland (BoCCI; Colhoun & Cummins, 2013), and ten species (sparrowhawk, snipe, short-eared owl, kestrel, goldcrest, swallow, mistle thrush, robin, wheatear and linnet) that are amber-listed. A complete list of bird species recorded is presented in Appendix 6.5.

The development site presents suitable foraging habitat for raptors and owls as illustrated by the records of sparrowhawk, buzzard, short-eared owl and kestrel). However, all these species were only seen on one or two visits during the waterbird survey (kestrel was also recorded on some of the otter survey visits). Short-eared owl is an amber-listed species. It is a rare breeding species in Ireland and a scarce passage migrant and winter visitor. It is likely to only be an occasional visitor to the development site. The other three species are likely to have resident populations in the area. Buzzard and kestrel are unlikely to breed within the site due to lack of suitable nesting sites. Sparrowhawk could potentially breed within the development site. Sparrowhawk and kestrel are both amber-listed species, but are widespread in Ireland.

The development site is located within a few kilometres of a hen harrier winter roost and it is likely that hen harriers use this habitat at times. However, there were no observations of hen harriers hunting over the site during the bird survey work (a total of nine days on site), or during other ecological survey work carried out for this assessment. Therefore, any usage of the site by hen harriers is likely to be irregular at best. Furthermore, hen harriers range widely in winter and can regularly forage up to 10 km from their roost sites.

Wet areas within the development site provide habitat for small numbers of wintering snipe, but there is no suitable breeding habitat for this species within the site. Snipe is an amber-listed species, but its listing refers to its European conservation status. In Ireland, breeding snipe are of conservation concern, but wintering snipe occur in every wet area throughout the country.

The only other waterbird species recorded within the development site was grey heron with a single record of a bird flushed from the reedbed area. The development site could potentially provide breeding habitat for a few pairs of shelduck and mallard, but no other waterbird species are likely to breed in the site.

A range of common bird species associated with grassland, scrub, woodland and hedgerow habitats were recorded during the waterbird survey visits and most of these species are likely to breed within the site. While these include some red and amber-listed species (goldcrest, swallow, mistle thrush, robin, wheatear, meadow pipit and linnet), these are all (with the exception of wheatear) widespread and common species and do not represent populations of specific conservation importance that require site-specific conservation measures. The wheatear record refers to a migrating bird and wheatears are commonly seen around the Irish coastline on spring and autumn migration. The development site is well outside the breeding range of wheatear and does not contain suitable breeding habitat for the species.

Two other red-listed bird species have been recorded from a 4-km square polygon taking in the lower Slaney estuary and hinterland (squares T02 H, M, G, L; NBDC database): grey wagtail and yellowhammer. Grey wagtails are associated with fast flowing streams and rivers, frequently building their nests under bridges. The development site and surrounding area does not provide suitable breeding habitat for this species, although it may occur as an occasional visitor. Yellowhammer is widespread along the east and south coasts and is strongly tied to cereal farming. It nests in hedges, patches of scrub, and ditches, and prefers areas with a wide grass margin next to them, and a cereal crop next to the margin. While the hedgerow and scrub habitats in the development site may provide suitable nesting habitat for the yellowhammer, the lack of cereal growing in the area would mean the development site is not particularly suitable for this species and it is not expected to occur or breed on the site.

Other breeding species that could occur within the development site include: willow warbler, sedge warbler, blackcap, whitethroat and stonechat. Stonechat is an amber-listed species but it is a widespread species and, if it does occur within the site it would not represent a population of specific conservation importance that requires site-specific conservation measures.

There are extensive reedbeds around the Ferrycarrig subsite. These are likely to support breeding populations of reed warbler, which is a rare breeding species in Ireland that is well established in the Wexford area. Therefore, it is possible that reed warbler breed in the reedbed adjacent to the southern margin of the site, although any such population would only form a component of a larger population.

Conservation evaluation: The bird interest on the site is evaluated as of local importance (lower value). Depending upon the size of the population, any breeding reed warbler population that occurs around the Ferrycarrig subsite may be of national or county importance.

Reptiles

Common lizard

The development site provides suitable habitat for the common lizard (*Zootoca vivipara*). The common lizard is a protected species under the Wildlife Acts. There is one record of the common lizard from the 1 km square (T0323) from 1972. The common lizard has also been recorded in eighteen 10-km squares in Wexford with the majority of records near the coast. However, the common lizard is probably under recorded in the county as elsewhere.

Common lizards are widespread and can be found in a range of habitat types. They reach highest densities in bog, heath and coastal habitats and the margins of coniferous woodlands. They also tend to be common in a range of grassland habitats, particularly those not subject to heavy grazing pressure, and can make use of gardens, other suitable features in built-up areas and post-industrial sites. Within these habitats, lizards need access to basking sites often on south-facing slopes and hedge banks or areas with micro-topographic variation, and with structurally-diverse mosaics of vegetation and exposed substrates. Lizards need refuges or places of shelter including patches of dense vegetation, rock and soil fissures, log piles and mammal burrows. Foraging areas include features with a high concentration of prey. Commonly used sites for hibernacula include free-draining structures, usually with a sunny aspect, including a similar range of features as are used as refuges (NRA, no date).

The common lizard is listed as least concern on the current Red List for Amphibians, Reptiles and Freshwater Fish in Ireland (King *et al.*, 2011) due to its widespread distribution, no evidence of any significant decline, and European status of least concern. While there is no population estimate available for Ireland, there is no evidence of a population decline.

Conservation evaluation: The lizard is expected to be widespread and common in the coastal areas of county Wexford. The habitats on site are suitable for the lizard and the population may be significant at a local level. The population of common lizards expected at this site is evaluated as of local importance (higher value).

Amphibians

There are three protected amphibian species in Ireland, which are protected under the Wildlife Acts the common frog, smooth newt and natterjack toad. The natterjack toad is additionally protected as an Annex IV species and a strict protection regime must be applied across their entire natural range within the EU, both within and outside Natura 2000 sites. The natterjack toad exists at the edge of its climatic range in Ireland. Its natural range is in the south west of Ireland. A population of natterjack toad was translocated to the Raven Point Nature reserve in the 1970s and still persists there but this is outside of the species' natural range. There are no records in Wexford outside of the Raven Point. The natterjack toad is not expected to occur on the development site.

Common frog

The site presents suitable habitat for frogs with long grass and wet temporary pools, however the pond may not be suitable spawning habitat due to its brackish nature. Given the lack of drainage ditches and the temporary nature of the wet pools and depressions the frog population is not anticipated to be very large.

The common frog is widespread and common throughout Ireland. It is found in every county and from sea level to uplands (King *et al.* 2011). There is some evidence of habitat loss (particularly pond loss) in Ireland, but no evidence of population decline. The overall status of the common frog in Ireland has been assessed as favourable (NPWS, 2013).

Smooth newt

The smooth newt (*Lissotriton vulgaris*) breeds in ponds and still-water ditches where pH >5. The newt shows a preference for vegetated water bodies with surrounding terrestrial habitats that provide cover for foraging and hibernation (King *et al.*, 2011). The pond is not thought to be suitable for newts due to the lack of vegetation diversity and its brackish and stagnant nature. There is a lack of wet drainage ditches on site to support newts. It is anticipated that the smooth newt does not occur on site or if present the population is predicted to be very small.

Conservation evaluation: The amphibian population is evaluated as of negligible importance based on the fact that the population is anticipated to be very small due to the paucity of suitable wetland or freshwater features and drainage ditches on the site.

Fish and benthic fauna

Inland Fisheries Ireland provided the following information regarding the estuarine environment in Wexford in response to formal consultation regarding the development (See Appendix 6.1 for a copy of the response letter).

"The Slaney River is an important salmonid system with populations of salmon, brown trout, sea trout, eels, twaite shad and lamprey. Estuaries and inshore waters provide significant nursery habitat for the larval and juvenile forms of (transitional and marine) fish species, in addition to providing food shelter and food for many young and adult fish and shellfish. These in turn provide food and resources for other levels of the trophic chain including shore birds, waterfowl, larger fish and marine mammals. Intertidal areas host high densities of benthic fauna in particular worms and molluscs. This in turn can make them important habitats for juvenile fish such as flounder and juvenile crustaceans such as crabs which may inhabit such habitats in high numbers.

The majority of fish in estuaries feed primarily on the benthos and thus live a demersal existence. Estuarine fish can generally be divided into a number of groups

- Estuarine dependent (opportunists) species typically enter estuaries from the sea for a period each year but do not stay permanently. The majority of these fish drift into estuaries as larvae and when as young fish they become demersal, they take advantage of the rich benthic food sources available in the sublittoral and intertidal estuarine habitats.
- Marine stragglers enter estuaries irregularly and are often restricted to the seaward end (usually low in numbers of individuals).
- Riverine species come from the freshwater end of the system and are mainly found in low salinity waters.
- Truly estuarine species (resident) comprise only a small number of species although they may form a high overall biomass. The gobies are most typical of this group and they are found in estuaries around the year.
- Migratory species use the estuary and inshore waters as a route from rivers to the open sea or vice versa. Most of these species are anadromous (breed in freshwater) e.g. the lampreys, the shad, and the salmon/sea trout. Eels (*Anguilla anguilla*) are catadromous and breed in the sea.

In addition there are classified shellfish areas located in the inner Wexford Harbour adjacent to the site and the outer Wexford Harbour. Both areas are mussel fisheries. According the data from the Sea Fisheries Protection Authority, the inner Wexford Harbour is a dormant fishery (fishery has been dormant for at least 12 months)".

Conservation evaluation: The estuary is part of the Slaney Valley SAC and Wexford Harbour and Slobs SPA with populations of Annex I fish species, and benthic communities which are an integral part of the ecology of the SAC and SPA. Fish and benthic fauna are evaluated as of international value.

Terrestrial invertebrates

There were no rare or protected invertebrate species listed in the NPWS database for the 10 km local to the development site. The suitability of the habitats on site to support populations of invertebrate species is assessed below with a focus on those groups for which there are red lists available.

The development site is expected to provide good habitat for a range of invertebrates typical of lowland hedgerow, grassland habitats and brownfield sites. The flora of the site would support pollinating species such as bees, hoverflies, butterflies and moths. The small areas of sand and gravel spoil may provide suitable nesting habitat for a range of invertebrates including some solitary bee species. South facing grassy banks also provide suitable nesting habitat for a range of invertebrate species.

Butterflies

The NBDC hold records for the 1-km square from 2010 for ringlet, meadow brown and painted lady butterflies all of which are listed as of least concern on the current red data list for butterflies (Regan et al., 2010). The floristic nature of the site would provide foraging habitat for a range of common butterflies typical of lowland grassland and brownfield sites including peacock, red admiral, small tortoiseshell, orange tip and the small, large and green-veined white butterflies.

Of the butterflies which are listed as near threatened on the current red data list, the site may present suitable habitat for the dingy skipper, the gatekeeper and possibly grayling. The dingy skipper is a small and inconspicuous butterfly and requires sites with a warm microclimate, short vegetation and shallow soils. Its food plant, common bird's-foot trefoil occurs frequently on the development site. Many colonies exist on semi-natural habitats, principally unimproved dry calcareous grassland and limestone pavement. However populations of the butterfly also exist on a wide range of semi-natural and man-modified situations ('brownfield' sites), including abandoned quarries and pits, woodland clearings, sunny sides of esker ridges and dunes, cutaway bogs, roadside verges and canal banks (Regan et al., 2010).

The gatekeeper is restricted in its distribution in Ireland to an area south of a line drawn from Dublin to Tralee. County Wexford is a stronghold for the species along with counties Waterford and Cork (O'Donnell & Wilson, 2009). Local distribution in Wexford is restricted to coastal sites and it has been previously recorded in the 10-km square in which Carcur Park lies. It is found in warm sites with woody shrubs and rough grassland such as hedgerows and woodland rides and clearings. A population reduction has been directly observed in Wexford and mid Cork (although less than 30%) as well as a decline in the area of occupancy (Regan et al., 2010).

The development site may contain small areas of habitat suitable for the grayling butterfly. Colonies of the grayling are found in open, dry situations that combine bare ground (sand, gravel and rock outcrops), sparse vegetation containing fine-leaved grasses and a warm aspect. The principal habitats are limestone pavement, unimproved calcareous and acid grasslands, sand dunes and dry heaths on the coast and on warm inland slopes. It is widespread in coastal locations and in a few inland areas such as the granite uplands of Co. Down and Wicklow and in the Burren. It has been lost from some sites in the midlands and Wexford. It is assessed as near threatened based on a population reduction is projected to be met in the future based on a decline in habitat quality (Regan et al., 2010).

The development site does not present suitable habitat for the small blue butterfly which is red-listed as endangered as although its food plant kidney vetch (*Anthyllis vulneraria*) was recorded on site there were only a few plants present which would not be considered frequent enough to attract or support a population of the small blue butterfly.

Bumble bees

Bombus lapidarius and *Bombus lucorum* agg. were recorded on site during the course of field surveys in May. *Bombus lapidarius* is a species of coastal and unimproved grassland and the bee is listed as near threatened on red list for bees (Fitzpatrick et al., 2006). Several cuckoo bumblebee species are listed on the red data list and there is some potential for them to occur on site due to the likely occurrence of their host species on site including the host species *Bombus hortorum*, *Bombus pascuorum* and *Bombus lucorum* which are all common and widespread species. The reasons for the decline in cuckoo bumble bee species is uncertain given that their host species are common and widely distributed.

Solitary bees and other invertebrates

Sand and gravel banks in old quarry pit provide potential nesting habitat for solitary bees and other insects

The combination of sheltered conditions, open flower-rich habitats and areas of exposed sandy spoil and banks provide excellent habitat conditions for solitary bees. Therefore, the site has the potential to support good populations of solitary bees, including species listed in the red list for bees (Fitzpatrick et al., 2006). For example, *Andrena barbilabris* (listed as near-threatened) is a ground-nesting species that is typical of sand dune habitats but also occurs in quarries. There is a large population of this species in the Raven Nature Reserve and the habitat conditions within the development site would be suitable for this species.

The above habitat conditions also provide suitable habitat for a range of other invertebrate species, and indicate that the site may support good faunas of other groups that are well-represented in early successional habitats. These may include ground beetles (Coleoptera, Carabidae), leaf beetles (Coleoptera, Chrysomelidae), weevils (Coleoptera, Ciculionidae) and true bugs (Hemiptera, Heteroptera).

Early successional habitats that are suitable for a diverse invertebrate fauna are quite scarce features in the Irish landscape, as they require a very particular combination of circumstances to persist. Therefore the site could potentially be of high local importance for solitary bees and invertebrates associated with early successional habitats, given the climate of County Wexford, the presence of diverse habitat types including sand and gravel spoil heaps and grassy banks, scrub and a diverse flora.

Dragonflies and damselflies

The development site does not present particularly good habitat for dragonflies or damselflies due to the lack of drains or streams on site. Although some wet depressions/pools exist on site these are very small and expected to dry up in summer. The pond to the north east may have some potential for damselflies tolerant of brackish conditions such as blue-tailed damselflies (*Ishnura* *elegans, Ishnura pumilio)* or the migrant hawker (*Aeshna mixta*) which breeds in a wide range of habitats including gravel pits and dune slack ponds (Egan and Wilson, 2015). However given the small extent and isolated nature of the pond the potential for these species to occur is considered low.

Blue-tailed damselfly and migrant hawker are listed as of least concern in the current red list and scarce blue-tailed damselfy is listed as vulnerable on the Red list No. 6 for Dragonflies and damselflies (Nelson *et al*, 2011).

Given the low potential for any threatened dragonflies or damselflies to occur, the site is evaluated as low local importance for dragonflies and damselflies.

Molluscs

NBDC 10 km square records hold historical records dating back to 1911 for several mollusc species which are listed as endangered, near threatened or vulnerable on the current red data list for non-marine molluscs. Of these species historically recorded, in the 10-km square local to the site, the following species could have some potential to occur on the site.

Aplexa hypnorum (1967) listed as vulnerable is a widespread but declining species in Ireland due to loss of habitat, such as infilling of farm ponds and ditches and land drainage.. The species prefers late successional habitats, ditches and ephemeral ponds and pools.

Gyraulus (Torquis) laevis is listed as endangered. Last recorded in the 10 km square in 1960. This species is a pioneer species frequently occurring in temporary or new habitats with hard or very slightly saline water, such as farm, coastal and quarry ponds. Severely declining primarily due to the nature of the transitory habitats it prefers and to habitat loss.

Pupilla (Pupilla) muscorum (1960) listed as endangered. This species is restricted to dry, calcareous, inland habitats, coastal dune systems and coastal calcareous rock exposures. The coastal populations are becoming increasingly rare and local. Under grazing may be a major threat to the species.

The brackish pond or the old quarry excavations could potentially provide habitat for these species. However, the potential for any of these red-listed molluscs to occur on the development site is considered low as the habitat extent is relatively small. This fact coupled with the historical nature of the records would indicate a low potential for the occurrence of these species on the site.

Water beetles

The pond may provide habitat for water beetles although its small extent would indicate that it is unlikely to contain a diverse range of species and may be restricted to those associated with brackish conditions. Records for brackish tolerant species in Wexford are mostly from the Lady's Island Lake and Tacumshin Lake in southern Wexford. Given the small extent of the pond habitat and the general paucity of aquatic life observed on sampling the potential for any of those species to occur is considered very low.

Overall invertebrate conservation evaluation: The invertebrate fauna of the development site is evaluated as of high local importance (primarily due to the likely presence of a diverse range of bees and butterflies and other species associated with early successional habitats) indicated by the floral diversity on site and the presence of suitable nesting habitat for a range of insect species.

Summary of conservation evaluation

A summary of the conservation evaluation of ecological features of high local conservation value or greater is provided in Table 6.4 below.

Table 6.4 Summary of conservation evaluation of ecological features of high conservation value on or adjacent to site

Ecological feature	Fossitt code/Annex Code	Area (Ha)	Evaluation	Rationale
Adjacent				
Slaney River Valley SAC			International value	Designated site under the Habitats Directive
Wexford Harbour and Slobs SPA and associated waterbird populations			International value	Designated site under the Habitats Directive
Saltmarsh	CM/1330	6.2 ha	County value	Non-designated Annex 1 habitat
Oak-ash-hazel woodland	WN2	0.56 ha	International	Within boundary of SAC/SPA
Reed and large sedge swamp	FS1	0.5 ha	International	Within boundary of SAC/SPA
Shingle and gravel shores/ sand shores	LS1/LS2/ 1210	1.44 ha	International	Annex I habitat 1210 located within SAC
On site habitats				
Exposed sand, gravel	ED1	0.33 ha	Local (higher value)	Population of two red-listed plant species (common cudweed, pale flax)
Hedgerow adjacent/within SAC	WL1	845m	International	Otter habitat
Pond	FL8	0.03	Local (higher value)	Component of otter habitat/resources
On-site species				
Otter	N/A	N/A	Local (higher value)	Local population of Annex 1 species
Common lizard	N/A	N/A	Local (higher value)	Locally significant population of protected species
Invertebrates	N/A	N/A	Local (higher value)	Potential diversity of species associated with early successional habitats

6.4 Impact assessment

6.4.1 Potential impacts on Natura 2000 sites

The potential impacts on the conservation objectives of Natura sites within the zone of influence of the development have been fully assessed in a Natura Impact Statement (NIS) produced in respect of the development.

Natura sites screened in for assessment in that NIS include:

- Slaney River Valley SAC
- Wexford Harbour and Slobs SPA
- The Raven SPA

The conclusion of that NIS is that provided mitigation measures are incorporated in full there will be no significant direct, indirect or cumulative negative impacts on the integrity of the Natura Sites.

In summary, the NIS assessed the following potential impacts on sensitive features of the adjacent Natura sites.

Slaney River valley SAC

Habitat loss

The installation of the surface water outfall pipes will involve disturbance of 0.08ha of intertidal mudflats containing estuarine muds dominated by polychaetes and crustaceans complex amounting to 0.014% of this community complex. The habitat is expected to make good recovery within 6-12 months of the impact.

This is not considered to be a significant negative impact due to the very small area of habitat involved and the temporary nature of the impact.

The potential to alter patterns of erosion and deposition was investigated by a Site Specific Flood Risk Assessment carried out by hydrological engineers IE Consulting (Chapter 7). No significant impact is anticipated as a result of raising the level of the site and potential displacement of flood waters during a 1 in 1000 year (0.1% AEP – Annual Exceedance Probability) tidal flood event. The volume of water predicted to be involved is negligible given the massive volumes of water conveyance by the Slaney during an extreme 0.1% AEP tidal flood event and would have an imperceptible impact on the hydrological regime of the area.

The site was examined for the deposition of sediment from the estuary by carrying out a high resolution aerial survey and a detailed walkover survey by a hydrological engineer from IE Consulting. There is no evidence to suggest any area of the site forms part of the natural sediment transportation and deposition regime of the Slaney Estuary. There was also no evidence to indicate any significant erosion within or along the boundary of the proposed development site.

There are five attenuation systems proposed within the development site, which have been designed for no flooding up to the 1 in 100 year rainfall event. The discharge from each of these attenuation systems shall be limited to Greenfield Runoff rates using a flow control device such as a 'Hydrobrake'. The discharge pipes shall be fitted with tidal flaps and shall discharge to the estuary."

Development of the site is therefore not expected to have an adverse impact on the existing hydromorphological regime of the Slaney Estuary.

Deterioration in surface water quality

Potential impacts from this development to the aquatic habitats and species of the Slaney River Valley SAC primarily relate to potential impacts on estuarine and transitional water quality as a result of the construction activities or storm water discharges arising from the development into the estuary waters.

Pollution of groundwater during construction at the site could also have an impact on the estuarine waters. Pollution of surface or groundwater could arise as a result of fuel leakages from machinery and inappropriate use or disposal of hazardous chemicals including paints, solvents etc. Inadequate control of surface water run-off during construction earthworks could result in sediment transfer to the estuary.

Detailed mitigation measures to avoid negative impacts to water quality are included in the NIS and construction management plan. There will be no deterioration in groundwater or surface water quality as a result of this development and consequently no impact to aquatic habitats or species as in summary:

- Waste water from the development will be piped to the Wexford Town Urban Waste Water Treatment plant (UWTP). The pumping station and associated foul sewer networks will be designed and constructed in accordance with the relevant Irish Water Code of Practice and Standard details. A connection agreement has been received from Irish Water. According to information on the EPA maps (**https://gis.epa.ie/EPAMaps/)** this WWTP provides secondary treatment for nitrogen and phosphorus and is compliant
- The storm water drainage infrastructure includes oil interceptors, silt traps and attenuation stores designed to attenuate the 100 year storm and will discharge to the subtidal water of the estuary and will discharge to the subtidal waters of the estuary.
- A construction management plan including a specific methodology with associated drawings to contain soil and sediments on site and prevent construction site runoff has been drawn up for all phases of the development
- Prior to construction commencing, detailed construction method statements will be drawn up in consultation with NPWS and Inland Fisheries Ireland (IFI) and approved. This will include best practice construction site management and specific mitigation measures to control construction site drainage and sediment run-off in order to avoid any transfer of sediments or pollution to the estuarine waters or to groundwater.

- A Project Ecologist will be appointed during all construction phases to oversee the implementation of mitigation measures.
- Potential deterioration in water quality (from littering) during the operational phase will be discouraged by the design and layout of the development. No residential units back onto the shoreline habitats. A fence line along the shoreline and retention and scrub and hedgerow habitats along the shoreline coupled with further hedgerow planting will provide a buffer to the shoreline discouraging access and dumping.

Potential impacts on Annex II fish species

No significant impacts to fish species were identified during the construction or the operational phase of the development. Construction of the surface water outfall pipes will cause localised increased suspended particles and turbidity of the waters of the rising tide. Due to the vast quantities of seawater and the tidal movements these mobilised sediments are anticipated to disperse widely and very quickly and there will no negative effect on fish species as a result of these works.

There is no significant risk of deterioration in water quality as a result of the construction or operational phase of the proposed development due to the implementation of the construction management plan including specific measures to avoid construction site run off or pollution of groundwater or surface waters and appropriate design of the wastewater and surface water infrastructure for the proposed development.

It was concluded that there would be there will be no significant negative effect on the Annex II fish species as a result of the proposed development.

Potential impacts on Common (harbour) seal (*Phoca vitulina*)

The breeding, moulting and haul sites of the harbour seal are approximately 5 km from the development site. At this distance, it is not anticipated that there would be any disturbance to the harbour seal population due to construction activities or due to ongoing residential activity at the site.

Installation of the pipeline outfalls is not anticipated to cause a significant negative effect on harbour seal due to the short term nature of the disturbance to feeding and commuting activity.

Potential displacement or disturbance to seals using the transitional waters adjacent to the development site from the land based construction activities is not anticipated to be significant. The boundary vegetation will serve to shield the construction activities to some extent. Use of the shoreline by residents is discouraged or prevented by the fence line and activities along the shoreline are not anticipated to significantly increase from the baseline situation.

As there will be no deterioration in water quality as a result of this development as outlined above there will be no effect on feeding resources for the harbour seal.

Therefore it was concluded that there will be no significant negative effect on harbour seals anticipated from this development.

Potential impacts on Otter (*Lutra lutra*)

The NIS assessed the potential impact to otter from the proposed development. A detailed otter survey (Appendix 6.2) was carried out to assess the potential impacts to otter as a result of the development. The results of the detailed otter survey identified that four important zones of otter activity exist adjacent to the proposed development. They include the following areas and are illustrated in Figure 6.6:

1. The open grassy embankment adjoining the woodland strip and small point to the north west of the site.
2. The small brackish pond to the north east of the site.
3. The large point and adjoining dry grassy areas to the north east of the site (majority of records detected here).
4. The south eastern extent of the site (near trackway through scrub) and adjoining reed swamp.

Otter habitat loss

The existing pond on site (with an area of 300 m^2) will be infilled as a result of the development. The pond is a component of the otter habitat and important to otters for washing their coats. For that reason the pond is evaluated to be of high local value. Otherwise the pond at present is of limited value to biodiversity in the wider sense.

The construction of the retaining wall will result in removal of approximately 2m depth of the existing vegetation within the otter boundary during the construction. However as the vegetation is approximately 10m deep along most of the shoreline and will be replaced immediately with new planting of hedgerow/scrub native plant species this is not anticipated to have a significant effect.

Construction of the surface water outfalls will require removal of vegetation and excavation along the line of each pipeline though the otter boundary at 5 locations/ At three of these locations this will involve removal of scrub/hedgerow habitat

Disturbance due to construction activities
Construction activities on the development site have potential to cause disturbance and potential displacement to the otter during construction particularly if a natal holt was established in the area. However, no evidence to indicate the presence of a natal holt was found during the otter surveys.

Mitigation measures for otter

Detailed mitigation measures both incorporated into the design of the development and into the construction management plan have been proposed to avoid any significant impacts to otters. These are detailed in the NIS and are summarized here.

- A project ecologist will be appointed to the project to oversee the implementation of all mitigation measures for this development including those to prevent disturbance to otter.
- The marginal grassland, hedgerow and scrub habitats used by the otters will be retained with any breaches of the habitat to facilitate construction of the retaining wall and outfall pipes as outlined above replaced immediately with native planting.
- The design of this development has incorporated a minimum of 10 m buffer from the bank line along the shoreline within which the vegetation (hedgerow, scrub and grass areas) will be retained, restored and enhanced with supplemental planting where needed.
- There are some areas where more than 10 m is available to otters: e.g. around the new pond area, the area adjacent to the reed bed in the south east of the development and around the proposed new sand/gravel embankment at the western end of the site.
- Prior to infilling of the existing pond a new pond of comparable area (297.3m^2) will be created close to the site of the existing pond within the otter habitat which will be fenced off preventing public access. Access for maintenance will be maintained by locked gates. The design of the pond has been informed by best practice construction methodology for wildlife ponds. The pond will be constructed using either a clay or butyl line depending on soil and ground conditions on excavation. Water levels in the pond will be maintained by a feed of clean pollution free freshwater. It is proposed that some of the surface water drained from the development site will be routed though the otter pond. The pond will be of varying depths, shallow at the edges graduating to a maximum depth of 1-1.5 m. It will be planted up with native aquatic plant vegetation. An area of marsh habitat will also be created at the margin. The area around the pond will be seeded with native grasses. Hawthorn and native willow trees will be planted around the pond to provide cover and seclusion.

- The pond will be monitored to confirm its use by otters prior to the infilling of the existing pond. Monitoring will include surveys of signs of use by the pond by otters recording slides and spraints and if necessary the use of trail cameras.
- This otter habitat area along the entire shoreline is to be permanently fenced off from the development with no public access to the shoreline. The fencing proposed is a low wall (575 mm) with a fence above of 1525 mm. The total height will be 2100 mm high. The fenceline is designed to discourage access to the shoreline habitat by people and stray dogs. Additional native hedgerow planting along the development side of the boundary fencing will further screen and buffer the otter habitat from the development.
- The proposed lighting design will ensure that the lighting around the perimeter of the development is directional to prevent overspill onto the shoreline habitats**.** There will be no deterioration in water quality of the transitional waters adjacent to the site and therefore no impact on feeding resources available to the otter.

Mitigation of construction impacts to otters

Prior to construction commencing, a preconstruction otter survey will take place to identify any changes in otter activity and holt locations since the otter survey

- The pre-construction otter survey will inform site-specific mitigation to avoid significant disturbance to otters following *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes* (NRA, 2006). Detailed measures are outlined in the NIS.
- Detailed construction method statements will be drawn up for site infill and construction to avoid unnecessary damage to the scrub/hedgerow habitat along the otter boundary.
- The retaining wall will be built along the otter habitat boundary and temporary fencing will be fixed to this until the permanent shoreline wall and fenceline is constructed for each completed phase of the development.
- Security fencing will be erected for each phase of the development to prevent access by the public to the shoreline until the permanent shoreline fence line is complete for the entire development.
- Vegetation removal to facilitate the construction of the retaining wall and the construction of the outfall pipes will be replaced immediately with hedgerow planting of native species including hawthorn, blackthorn and/or gorse.

Residual impacts of construction activities

It is anticipated that there will be slight temporary disturbance effect on otter during construction of the retaining wall, the new pond and the installation of the surface water discharge outfalls. This slight disturbance impact is not anticipated to cause a significant negative effect to otter due to the temporary nature of the works and the fact that construction work will be carried out during the daytime when otters are least active.

Residual impact of otter habitat loss

The pond will provide an improved resource for otters. It will be a freshwater pond which will be more beneficial to otters for washing their coats than the existing brackish pond. The pond may supply an additional food resource as frogs and possibly newts are anticipated to occur in the pond. The pond is also anticipated to be populated by a wider range of invertebrates such as beetles, dragonflies, damselflies and of benefit to local biodiversity in general.

Implementation of the mitigation measures outlined above will avoid any significant impact to otters near the site and therefore no significant impacts to otters are anticipated due to the construction activities on site. The residual impact will be **a positive impact at the local scale** by the creation of an improved freshwater pond habitat which will be benefit to otter but also other wildlife.

Ongoing disturbance to or displacement of otter due to residential activities

It is not anticipated that ongoing disturbance due to residential activities would have a significant impact on the otter. The otter habitat comprising the banks adjacent to the shoreline, the pond area and the associated hedgerow and scrub habitat will be retained. The scrub and hedgerow provide good cover for the otter. Otters are most active at night and early morning when residential activity would be expected to be lowest. The fence will serve to prevent access to the otter habitat by people or dogs which could cause disturbance to otters.

Furthermore, construction of the development is scheduled in four phases. Therefore the level of human activity on site will be gradually increase over time so that if human activity and change in the environmental conditions is detected by otter this will be more gradual than if the site was developed all at once. Otter may then habituate gradually to any human activity/traffic noise etc. that they detect.

The finding of no significance disturbance to otters is supported by the literature and this is discussed and referenced in the NIS.

It concluded that there will be no impact on the otter population due to disturbance or displacement of otters caused by residential activities in the area.

Impact from the potential spread of invasive plant species

The potential impact from the spread of invasive plant species has been addressed in the NIS.

The legally controlled invasive plants Japanese knotweed (*Fallopia japonica*) and three-cornered leek (*Allium triquetrum*) are present on site. The spread of these species to the shoreline habitats could have a negative impact by outcompeting native species and contributing to bank erosion. The spread of these species in controlled and subject to regulation under Section 49 of the Birds and Habitats Regulations 2011.

Other plant species with invasive tendencies are present on site including winter heliotrope (*Petasites fragrans*),Traveller's joy (Clematis vitalba) and butterfly bush (*Buddleia davidii*). Uncontrolled spread of winter heliotrope could also negatively affect the shoreline habitats.

There is a risk of importation of invasive plant species with imported infill required to raise the level of the site.

Mitigation of the potential spread of invasive plant species
The risk of spread of invasive plant species present on the site to the shoreline habitats will be minimised by the implementation of an appropriate invasive species management plan which will be agreed with NPWS prior to construction commencing to prevent the spread of these species within or outside the site.

An invasive plant species management plan will be drawn up and implemented by an invasive plant species specialist to treat and prevent the spread of the invasive plants species on site.The invasive species management plan will:

- Identify and map all locations of Japanese knotweed, three-cornered leek, winter heliotrope and other invasive plant species within the site.
- Establish exclusion zones around the Japanese knotweed to prevent incursion by construction vehicles and personnel onto areas of Japanese knotweed
- Present control and eradication options for the treatment of Japanese knotweed – e.g. herbicide treatment, stockpile and bund method or burial. (Note as site will be infilled burial may be an option but this would be subject to consultation with the local authority and the NPWS).

Therefore the risk of spread of invasive plant species will be minimised and therefore no impact from the spread of invasive plant species on the habitats of the SAC or the wider area is anticipated.

Potential impacts on the Wexford Harbour and Slobs SPA and the Raven SPA
The SCIs of the Wexford Harbour and Slobs SPA and the Raven SPA include one species that could potentially use habitat within the development site for foraging (hen harrier) as well as several waterbird species that regularly use the tidal habitats adjacent to the development site.

The impact of habitat removal on the availability of potential foraging habitat for hen harriers was not considered to be significant as there was no evidence of harriers regularly using this area, and the scale of habitat to be removed is insignificant in the context of the harriers' likely foraging range.

The waterbird SCI species that use the tidal habitats adjacent to the development site could potentially be affected by disturbance impacts, both from construction work, and from activity generated during the operational phase of the development. These potential impacts are discussed in detail in relation to the non-waterbird SCI species in Section 6.4.3 of the present chapter, and a summary of the potential impacts to the SCI species is included there.

6.4.2 Potential impacts to on-site habitats, flora and fauna

Do nothing scenario

In the absence of any development, the development site would be encroached by scrub species in the short term and over the longer term the site would succeed to woodland. The floral diversity on site would decrease as scrub encroachment and woodland would shade out and compete with the early successional plant species present on site. The fauna interest of the site over the long term would include birds and mammals associated with a woodland habitat. The current level of informal recreational use of the site may decrease as the site becomes more overgrown.

Impacts on habitats and flora

Habitat loss

Recolonising bare ground (ED3): There will be a permanent loss of 4.2 ha of recolonizing bare ground habitat evaluated as of low local conservation value. Species diversity varied across the habitat. The highest species diversity was found in the previously quarried area towards the western end of the habitat where a diverse range of common species occurred. One species considered uncommon in Co Wexford - sharp-leaved fluellen - was found in this recolonizing bare ground habitat in the centre of the site. This species is listed as of least concern in the *Red List for Vascular Plants* (Wyse-Jackson *et al.,* 2016). It is estimated that approximately one quarter of thee recolonizing bare ground habitat (ED3) habitat (approximately 1 ha) contains a high plant species diversity.

The loss of this habitat will be a permanent **significant negative effect at the low local scale** of approximately 1 ha of habitat.

Mitigation of loss of recolonising bare ground

- Prior to site clearance of this area of habitat, a botanical survey will be carried out to check for the occurrence of any rare/protected plant species and if found appropriate mitigation will be put in place in consultation with the NPWS to translocate the species under licence if required to a suitable receptor site.
- Translocation will follow best practice guidance including:
    - Anderson Penny (2003). Habitat translocation a best practice guide CIRIA C600
    - Box John 2003 Critical Factors and Evaluation Criteria for Habitat Translocation. Journal of Environmental Planning and Management, 46(6), 839–856
- There is scope for suitable receptor sites for many species on, and adjacent to the site including the new gravel banks at the west end of the site and around the new pond, embankments along the access road and the existing bare ground habitat adjacent to the rail line. Potential receptor sites are illustrated in Fig. 6.7
- Should sharp-leaved fluellen, an annual species recorded during field surveys in 2015, be refound then soils will be saved from the area and used in the creation of the new

sand/gravel embankments at the northern boundary at the western end of the site or by the new pond.

- The landscaping plan provides for native wildflower meadow (1,124 m^2) at the margins of the amenity grassland areas which will provide habitat for a variety of wildflowers including species typical of coastal grasslands including wild carrot, bird's foot trefoil, common knapweed amongst others.

Residual impact: The residual impact is expected to be a **moderate negative impact at the low local scale** due to the loss of approximately 1 ha of habitat of high flora species diversity.

Exposed sand and gravel (ED1) and notable flora

There will be a loss of 0.25 ha of exposed sand and gravel (ED1) habitat. A diverse flora most notable for the occurrence of a population of common cudweed occurs on the floor of the previous quarry pit covering an area of approximately 1000 m^2. The density of common cudweed plants was recorded as 55 plants/m^2. Common cudweed is listed on the red list for vascular plants as vulnerable (Wyse-Jackson *et al.,* 2016). It is relatively common in County Wexford compared to its occurrence nationally. A few plants of pale flax also occurred on bare ground on the access track into the site close to this area.

The loss of the exposed sand and gravel (ED1) habitat is likely to be a **significant negative impact at the high local scale**.

Mitigation of loss of sand gravel habitat

- Sand and gravel from this area will be saved and used to create sand and gravel habitat (693 m^2) as a flat gravelled area and embankment along the northern boundary at the west end of the site. The location of the embankment is shown on the landscaping plan and in Fig. 6.7 below. Further areas of gravel banks will be created around the pond (139.9 m^2). The total area of sand/gravel habitat created will be approximately 833m^2. Public access to these embankments will be prevented by the boundary fence but access by way of a locked gate will be provided for maintenance. The embankment is anticipated to be recolonised naturally by species from the seed bank in the sand and gravel. Common cudweed and pale flax are annual species. Seeds are expected to persist in the sand and gravel and the plant is expected to re-occur on this embankment. Other species typical of the habitat such as common centaury and yellow wort are also biennials or annuals and are also predicted to re-occur along with other species recorded in the habitat.
- Prior to site clearance or site infill of this area of habitat a botanical survey will be carried out to check for the occurrence of any protected, or notable, plant species and to select the best area(s) of sand/gravel to be saved in order to conserve a diverse seed bank and particularly including the areas where common cudweed and pale flax occur.
- Translocation of soils will be supervised by an ecologist and a detailed translocation methodology will be drawn up and submitted to NPWS for approval. Translocation methodology will follow best practice guidance including but not limited to:
    - Anderson Penny (2003). Habitat translocation a best practice guide CIRIA C600

- Box John 2003 Critical Factors and Evaluation Criteria for Habitat Translocation. Journal of Environmental Planning and Management, 46(6), 839–856

- The habitat will be maintained annually by a 3 year cycle of rotational strimming and removal of the vegetation to prevent encroachment by scrub species and manual disturbance by light scarification to promote germination of seeds. An outline Habitat Management Plan is provided in Appendix 6.7.

Residual impact The residual impact depends on the success of the habitat creation. It is anticipated that there is a high probability of success and the creation of the sand/gravel habitat will reduce the impact of the loss of the exposed sand and gravel habitat and provide for the persistence of the plant species on the site. There may be a reduction in the number of plants initially but as annual species, the populations should recover over the short term (1-7 years). Fencing of the habitat will have a positive impact as it will prevent disturbance to the habitat which currently occurs due to the site being disturbed by quad bike riding and the lighting of small camp fires. While some disturbance may help maintain the habitat, if excessive, such activities present a risk. Protection by the fence and ongoing maintenance of the habitat will ensure its persistence. The residual impact of the loss of this habitat is anticipated to be **not significant over the short term.**

Scrub (WS1)

There is approximately 3.7 ha of scrub habitat on site. Scrub within 10 m of the boundary along the shoreline will be retained as otter habitat. Scrub will also be retained along the boundary with the reed bed at the south-eastern corner of the development. Scrub retained totals approximately 1.5 ha. Construction of the development will therefore remove approximately 2.2 ha of scrub habitat.

The internal scrub habitat has been evaluated as of low local importance primarily for its value as nesting habitat for birds and shelter for small mammals. The removal of this scrub is anticipated to have a **slight negative impact at the local scale**.

Mitigation

- Site clearance will take place outside of the breeding season (which occurs during March 1st to August 31st inclusive) to avoid direct injury and disturbance to breeding birds. If this is not possible then a breeding bird survey will be carried out on any areas to be cleared and site specific mitigation measures put in place in consultation with the NPWS and appropriate licensing will be sought if necessary in to ensure compliance with the Wildlife Act 2000 (as amended).
- The landscaping plan provides for native hedgerow and tree planting which in time as they mature will provide nesting habitat and forage for some bird species.
- In time, gardens associated with the development are expected to provide suitable habitat for some garden bird species.

Residual impact

The residual impact of the removal of scrub is anticipated to be **not significant**.

Oak-ash-hazel woodland (WN2)

There will be partial loss and/or disturbance to the area of oak-ash-hazel woodland (WN2) at the rail line boundary. This habitat is 0.33 ha in area and is evaluated as of low local importance. The partial loss or disturbance of this habitat is anticipated to be **not significant**.

Wet woodland (WN6)

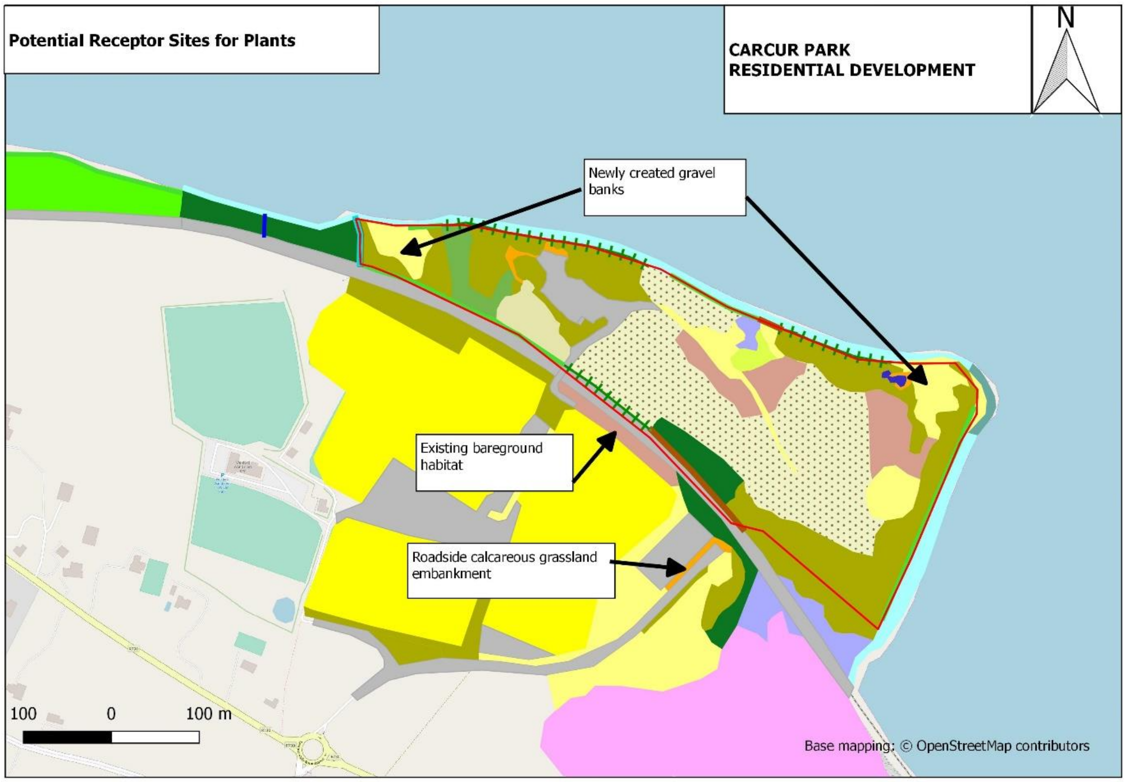
A small area (0.35 ha) of wet woodland will be removed from the site. This habitat has been evaluated or low local importance. The loss of this small area of woodland habitat is anticipated to be **not significant.**

SAC boundary hedgerow and treelines (WL1/WL2): The boundary vegetation will be protected during construction phases to minimise damage but construction of the retaining wall will remove a 2m strip of the boundary habitats. Installation of the surface water outfall pipes will also result in removal of 3 localised patches (each of approximately of 10 m length) of hedgerow habitat along the northern boundary and adjacent to the reed bed to the south east of the development site Prior to site infilling and construction of the retaining wall, a construction method statement outlining protection of the otter habitat and boundary vegetation during these site infill will be drawn up and approved by NPWS. The boundary vegetation will be retained in as far as possible and any vegetation removed or damaged will be replaced immediately with planting of native hedgerow species. The landscape plan also provides for enhancement of the boundary vegetation within the development site along the otter boundary fenceline.

There will be no long term significant impact to hedgerows and treelines within or adjacent to the boundary of the SAC.

Residual impact: The development will have a **permanent moderate positive impact** on the boundary vegetation at the local scale over the long term.

Figure 6.7 Potential receptor sites for rare and/or protected plants



6.4.3 Potential Impacts on fauna

Impacts on waterbirds

This section assesses the potential impacts of habitat removal and disturbance on waterbirds.

Several of the waterbird species potentially affected are SCIs of the Wexford Harbour and Slobs SPA and the Raven SPA. The potential impacts to these species are fully assessed in the NIS for this project.

The potential water quality impacts have been assessed in Section 6.4.1 above. This has concluded that the proposed development will not cause significant impacts to surface water quality. Therefore, no further assessment of water quality impacts in relation to potential impacts on the SCIs is required.

Artificial light is likely to have positive impacts on waterbirds in intertidal habitats by enhancing the efficiency of nocturnal foraging (Dwyer et al., 2013) and may also reduce predation risk to roosting birds (cf. Gorenzel and Salmon, 1995). Therefore, detailed assessment of the potential impact of light overspill from the proposed development is not required.

Habitat removal

The terrestrial habitat within the development site is not used by significant numbers of any waterbird species. There will be no removal of intertidal or subtidal habitat. Therefore, there will be no significant impacts from habitat removal on any waterbird species.

Habitat disturbance

Four stormwater outfalls will be constructed that will discharge into the tidal habitats to the north of the development site. These outfalls will consist of buried pipes that will discharge to the permanent subtidal zone. Installation of these outfalls will involve disturbance to sediments along the corridor around 10 m wide along the length of each outfall. The total area of intertidal habitat disturbed will be 0.08 ha. This amounts to around 0.1% of the mapped area of intertidal habitat in the Ferrycarrig subsite under moderate spring low tide conditions (see Fig. 6.2). As the outfalls will discharge to the permanent subtidal zone, there will be no long-term impacts to the intertidal habitat through scouring, etc.

A study by Lewis et al. (2002, 2003) found temporary impacts on benthic fauna from pipeline construction in Clonakilty Bay, with good recovery 6-12 months after the impact. There was also reduced usage of the impacted area by foraging waterbirds, which may have lasted longer than the impact on the benthic fauna. However, there was increased usage by roosting waterbirds, which was considered to be due to the disturbed area providing shelter or camouflage. Based on this study, it can be predicted that the construction of the stormwater outfalls will cause temporary loss of foraging waterbird habitat. However, the magnitude of the impact will be very small, due to the small area involved, and the fact that the count sector (S4) in which the impact does not hold large numbers of waterbirds. Therefore, the overall impact on the waterbird populations that occur in the Ferrycarrig subsite will be negligible.

Potential impacts of disturbance

Disturbance impacts can affect bird populations in two ways. If disturbance levels are intense enough, birds may completely abandon an area and the disturbance impact is, therefore, analogous to habitat loss. At lower disturbance intensities, birds may continue to use an area but may suffer energetic impacts due to loss of foraging time and energy expended in evasive behaviour.

For disturbance to cause displacement impacts, the disturbance pressure will have to operate over a wide area (relative to the size of the site) and be more or less continuous. For disturbance to cause significant energetic impacts, birds must be disturbed with sufficient frequency, and/or forced to engage in energetically expensive evasive behaviour (e.g., long flights, or extended interruption of feeding). Various modelling studies have indicated that multiple disturbance events per daylight hour are required to cause impacts on wader survival rates (Goss-Custard et al., 2006; West et al., 2006; Durell et al., 2008).

Disturbance pressure

There is existing human activity within the site. The site is used as an informal recreation area, and people were observed walking in the site and/or along the eastern shoreline of the site on four of the eight count days. While some of these observations only refer to people seen in the interior of the site, it is likely that all the visitors to the site would walk to one, or more, of the shoreline areas. Higher levels of activity may occur at weekends (all the count days were during the week). Bait digging was recorded on the spit off the north-eastern corner of the development site on the one count day with spring low tide conditions when extensive intertidal sediment were exposed here.

The proposed development will clearly cause a major increase in levels of human activity within the site. This will occur both during the construction period and in the operational phase. During the construction period, major construction work will take place in close proximity to the shoreline. During the operational phase, there will be 419 households on the site, and people will use the green areas within the site for recreation, etc.

Sensitive species

The waterbird species that regularly use the intertidal and/or subtidal habitat adjacent to the development site include the following non-SCI species: Little Egret, Greenshank, Herring Gull and Great Black-backed Gull. Little Egret and Greenshank exclusively use intertidal habitat. Herring Gull and Great Black-backed Gull use both intertidal and subtidal habitat.

The following SCI species also regularly use the intertidal and/or subtidal habitat adjacent to the development site: Cormorant, Grey Heron, Little Grebe, Oystercatcher, Curlew, Black-tailed Godwit, Redshank and Black-headed Gull.

Disturbance responses

Intertidal habitat

A study of the disturbance responses of waterbird species in intertidal habitat adjacent to the development site was carried out for this assessment. The full results from this study are included in Appendix 6.3. A summary of the main findings relevant to this assessment is provided below.

The study found that, across all species, the modal direct response distance (RD) of birds flushed by walking along the shoreline was 50-75 m, and 85% of observations of birds flushing were at direct RDs of 150 m or less. Although the data was limited, Curlew appeared to have relatively large direct RDs with all four observations at distances of more than 150 m. The modal direct RD at which birds showed no response was 100-150 m, while birds could tolerate approach to within 25-50 m. On 29/09/2015, there were two bait diggers working off the shingle spit and there were 6 Oystercatcher and 36 Black-tailed Godwit feeding within 25-50 m, and 26 Redshank feeding within 50-75 m of the bait diggers. Similarly, these birds did not flush when the surveyor walked along the shoreline at similar distances from the birds.

As well as recording direct RDs, the disturbance study also recorded lateral RDs, which are the perpendicular distance from the shoreline. The reason for distinguishing between direct and lateral RDs is that birds are more likely to flush when they are in the direct path of the disturbance source. Therefore, a bird on the shoreline may flush at a long direct distance (with the lateral distance being zero), while the same bird on mudflats adjacent to the shoreline may tolerate approach to a much closer distance as the walker passes along the shoreline. The lateral RDs are probably more informative about the potential disturbance impacts because they indicate the width of the intertidal zone that will be potentially affected by disturbance.

Observations of lateral RDs during the disturbance study were limited, as they were only possible when there was sufficient exposure of intertidal mud. However, apart from Shelduck and Curlew, all the observations were at lateral RDs of 75 m or less.

Where the destination to which flushed birds moved was recorded, 63% of observations involved birds moving out of the sector. These usually involved birds moving between the two sectors immediately adjacent to the development site. Movements of birds to the sectors to the east and west and across the estuary to the opposite shore were also recorded quite frequently. There were only two observations of more distant movements.

Subtidal habitat

Waterbird species using subtidal habitat are generally less sensitive to disturbance impacts from shore-based activities and their disturbance responses were not systematically recorded during the survey work carried out for this assessment. Most observations of birds in subtidal habitat adjacent to the development site involved birds well out from the shoreline, and these birds showed no obvious disturbance response. On some occasions, Little Grebes that were close into the shoreline swam out a short distance as a disturbance response. There were also occasional incidents of Black-headed Gulls that were roosting on subtidal habitat close to the shoreline being flushed and resettling a short distance away.

Construction impacts

Potential impacts

Burton et al. (2002) studied the effects of disturbance from construction work associated with major development work on waterbirds in Cardiff Bay. Construction work caused significant impacts to birds on adjacent areas of mudflats with reductions in densities of five species (Teal, Oystercatcher, Dunlin, Curlew and Redshank) and in the feeding activity of three of these species (Oystercatcher, Dunlin and Redshank, and possibly also Curlew). The only species (of those studied) that was not affected by construction work was Mallard. The study was based on observations of bird numbers and behaviour in a number of count sectors and the results (as presented) do not indicate the distance over which the disturbance effects operated. However, the count sectors that were assessed as being disturbed by construction activities extended over distances of up to 500 m from the relevant construction site. Therefore, it is reasonable to assume that the disturbance effects extended over distances of a few hundred metres, as if they were confined to a narrow zone adjacent to the construction site it is unlikely that they would have been able to produce effects that were detectable at the scale of the analyses of whole count sectors. However, the study does not report the effect size (the magnitude of the reductions in density). Furthermore, Cardiff Bay is not a very good analogy with the proposed development: the Cardiff Bay development involved multiple major development projects (including the Cardiff Bay barrage, road/bridge construction, land reclamation, hotel and housing development) at a number of locations around the bay, several of which involved work directly adjacent to, or even extending on to, the mudflats. By contrast, the Carcur Park development involves a single construction location that adjoins a relatively small amount of the total extent of intertidal habitat in the Ferrycarrig subsite.

In contrast to Burton et al. (2002), other studies have reported reduced, or less clear-cut, impacts from major construction work.

The effects of the construction of the Mutton Island WWTP in Galway Bay on a high tide wader roost on this island have been reported by Nairn (2005). This study found no negative effects of construction disturbance. The development of the WWTP introduced access controls to the island and the numbers of bird using the roost actually increased due to reduced pedestrian disturbance.

Dwyer (2010) studied the effect of construction of major road bridge in the Firth of Forth (Scotland). Two species (Cormorant and Redshank) showed significant reductions in numbers in count sectors adjacent to the bridge, with a reduction of around 30% in Redshank numbers. Other species showed mixed patterns, depending on tidal state, showing increased numbers in count sectors adjacent to the bridge at certain tidal stages. The reductions in Cormorant and Redshank numbers were considered to reflect disturbance to their roost sites (low tide roost in the case of the Cormorant and high tide roost in the case of Redshank), which, for Redshank, may also affect their use of habitat at low tide as they tend to feed close to their roost sites. However, given that the study did not find consistent patterns across a number of species indicating displacement due to construction disturbance, it may not be appropriate to interpret the effects on Cormorant and Redshank as being proof of displacement impacts caused by construction disturbance.

Cutts and Allen (1999) and Cutts et al. (2009) report on the responses of waterbirds to flood defence works in the Humber Estuary (England). They found that disturbance impacts were related to the presence of people and the visibility of the works: piling activity behind a seawall had no apparent impact, while once the work extended onto the seaward slope, some impacts were noted. However, even then the impact was minor with birds continuing to feed around 200 m from the piling operations. Similarly, in another study in the Tees (England), percussive piling had no apparent effect on waterbirds in a mudflat 270 m from the piling location (quoted in PD Teesport and Royal Haskoning, 2007). Based on their research, and research on disturbance by military activities summarised by Smit and Visser (1993), Cutts and Allen (1999) suggest that noise levels in excess of 84 dB(A) cause flight responses in waterbirds, while below 55 dB(A) there is no effect, with a "grey area" in between. This assessment was refined by Cutts et al. (2009), who classified noise levels of below 50 (dBA) as having no effect, 50-70 dB(A) as having a moderate effect ("head turning, scanning behaviour, reduced feeding, movement to other areas"), 70-85 dB(A) as having a moderate-high effect, and above 85 dB(A) as having a high effect ("maximum responses, preparing to fly away and flying away, may leave area altogether").

They recommended that "ambient construction noise levels should be restricted to below 70 dB(A), birds will habituate to regular noise below this level", while "sudden irregular noise above 50dB(A) should be avoided as this causes maximum disturbance to birds".

Wright et al. (2010) investigated the response of waterbirds to experimental impulsive noise. They reported the following ranges of responses to various noise levels:

- No observable behavioural response: 54.9-71.5 dB(A) (with a high proportion of extreme outliers).
- Non-flight response: 62.4-79.1 dB(A).
- Flight with return: 62.4-73.9 dB(A).
- Flight with all birds abandoning the site: 67.9-81.1 dB(A).

It should be noted that both Cutts et al. (2009) and Wright et al. (2010) acknowledge limitations to the general applicability of the thresholds they specify. But these do provide some useful indication of the range of noise levels where impacts may occur, and 55 dB(A) has been used as a threshold noise level for assessing potential impacts in various assessments of potential impacts to waterbirds from development projects (e.g., the York Field Development Project; Rose, 2011).

Therefore, while the Cardiff Bay study indicates that disturbance impacts from multiple major construction projects could cause statistically significant displacement impacts (but of unknown magnitude) over a distance of several hundred metres from the development site, studies of single construction projects do not provide strong evidence of large displacement impacts.

Impact assessment

Noise disturbance to intertidal habitats

As discussed above, a range of noise levels have been identified as potentially causing disturbance to waterbirds. It is also necessary to take into account the degree of habituation to noise, which will vary from site to site, depending upon the existing noise environment. The research evidence on this subject was reviewed by Cutts et al. (2013), and they have identified general threshold noise levels for varying degrees of impacts, which also take into account habituation effects (Table 5). These threshold levels have been used for the purpose of this assessment.

Table 6.5: Threshold levels for assessing noise disturbance effects on waterbirds

Impact category	Response	Thresholds
High level	Regular responses to stimuli with birds moving away from the works to areas which are less disturbed (within noise tolerances). Most birds will show a degree of response to noise stimuli. Birds that remain in the affected area may not forage efficiently and if there are additional pressures on the birds (cold weather, extreme heat etc.) then this may impact upon the survival of individual birds or their ability to breed.	above 60 db (sudden noise event) above 72 db (prolonged noise)

Table 6.5: Threshold levels for assessing noise disturbance effects on waterbirds		
Impact category	**Response**	**Thresholds**
Moderate level	High level noise which has occurred over long periods so that birds become habituated to it or lower level noise which causes some disturbance to birds	above 55 dB (occasional noise events) 60-72 dB (regular noise) above 72 dB (long-term regular noise)
Low level	Unlikely to cause response in birds using a fronting intertidal area	less than 55 dB 55-72 dB in some highly disturbed areas

Source: Cutts et al. (2013).

The existing noise levels in the vicinity of the development site were measured as part of the noise assessment for this project (see EIS chapter 5). In the three locations measured the average noise levels (L_{AEQ}) were: 52-54 dB in location S01, 56-57 dB in location S02 and 48-54 dB in location S03 (see Figure 6 for locations). While there were no direct measurements of noise levels in the tidal habitat adjacent to the development site, these noise levels indicate that the birds using this habitat are unlikely to have become habituated to high, or moderate, level noise.

Information on projected noise levels from construction work within the site have been supplied by AWN Consulting (who carried out the noise assessment for this project). For each element of the works within the development site, based on the worst case assumption that all activity is occurring on the boundary of the site concurrently, the distances at which the threshold levels would occur are shown in Table 6.6. Noise levels above 72 dB are predicted to not extend more than 20 m beyond the site boundary. As there will be an undeveloped buffer at least 15 m wide, this means that, effectively, there will be no high level noise impacts to waterbirds in the adjacent tidal habitat. Noise levels above 60 dB are predicted to extend up to 55 m beyond the site boundary, while noise levels above 55 dB are predicted to extend up to 90 m beyond the site boundary. The extent of habitat potentially affected, based on these distance bands are shown in Figure 6. As the construction noise involves regular noise, rather than occasional noise events, the 55 m distance is more relevant. Therefore, it can be concluded that the maximum likely construction noise impact will be a moderate level impact to the intertidal habitat in S4 and S5.

Table 6.6: Buffer distances for specified noise levels from construction work in the development site			
Element	**Construction Noise Level (m)**		
	55dB $L_{Aeq(1hour)}$	**60dB $L_{Aeq(1hour)}$**	**72dB $L_{Aeq(1hour)}$**
Site Preparation	85 m	55 m	<20 m
Foundations	90 m	55 m	<20 m
General Construction	85 m	55 m	<20 m
Landscaping	75 m	50 m	<20 m

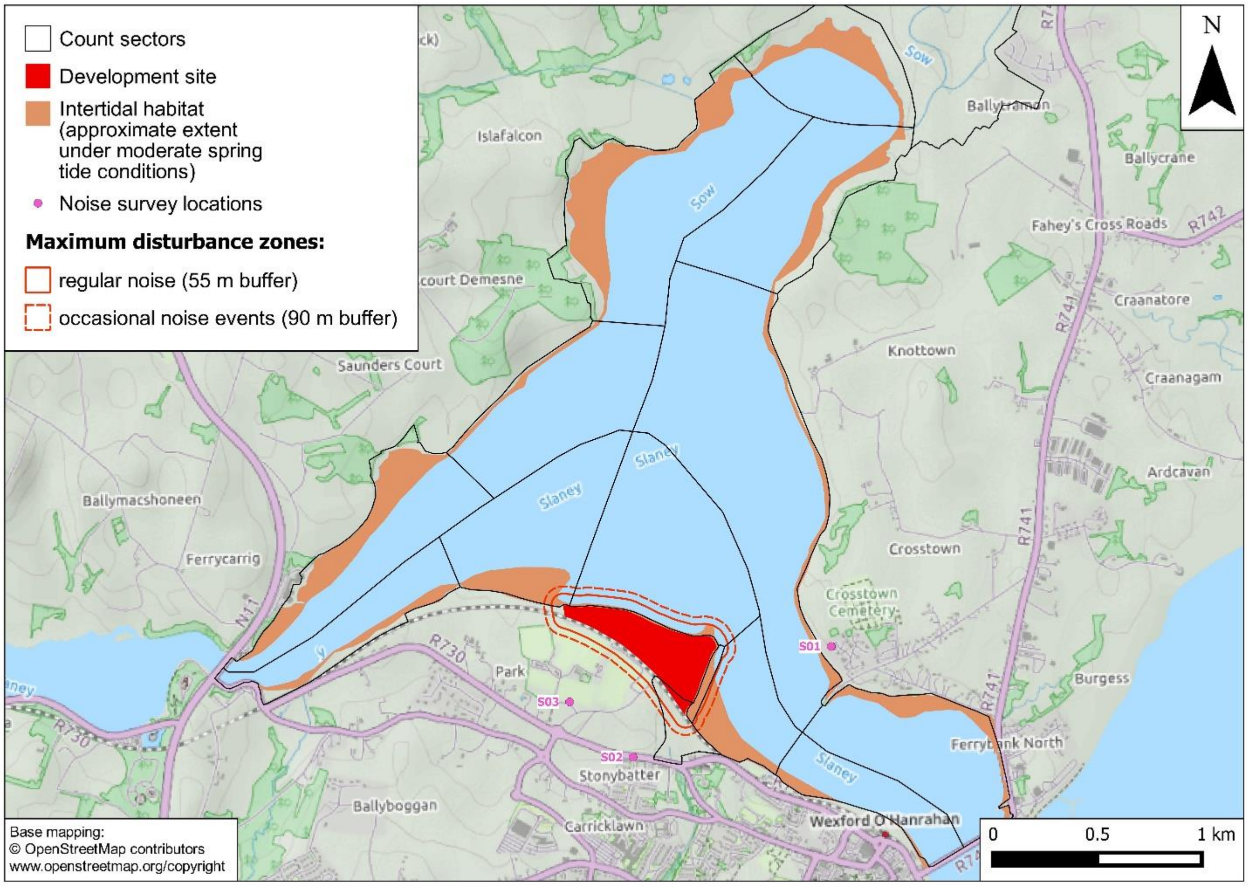
See text for assumptions.
Source: Ronan Murphy, AWN Consulting.

Based on the mean percentages of the Ferrycarrig subsite populations of the relevant species in the relevant sectors during the 2015/16 low tide counts, and the mean percentages of the Wexford Bay populations recorded in the Ferrycarrig subsite during the 2009/10 WSP programme, and assuming that these noise impacts caused complete displacement of birds from the affected areas, the potential displacement impact can be estimated. These calculations indicate that around 8-18% of the Ferrycarrig populations, and up to around 2% of the Wexford Bay populations, of the affected species would be displaced (Table 6.7). Similar calculations for the SCI species indicate that around 1-16% of the Ferrycarrig populations, and up to around 1% of the Wexford Bay populations, of the affected species would be displaced (see NIS). There are a number of uncertainties in the waterbird data used for calculating these potential displacement impacts. However, this is an extreme worst-case scenario due both to the assumptions made for the noise predictions (see above), the fact that development will take place in phases so only a proportion of the site will have active construction work at any one time, and the fact that moderate level noise impacts are generally unlikely to cause complete displacement of birds from the affected areas. Therefore, taking these factors into account, it can be concluded that construction noise is unlikely to cause significant disturbance impacts to any of the waterbird species covered by this assessment.

Table 6.7: Worst-case scenario displacement impact due to construction noise disturbance

Species	Number of birds displaced	% of Ferrycarrig population displaced	% of Wexford Bay population displaced
Little Egret	2.6	18%	1.8%
Greenshank	1.5	8%	2.2%
Herring Gull	1.0	13%	0.3%
Great Black-backed Gull	2.3	15%	0.4%

Figure 6.6. Approximate extent of intertidal and subtidal habitat potentially disturbed by construction noise disturbance from the development site



Visual disturbance to intertidal habitat

The potential impact of visual disturbance from construction work on waterbirds using the adjacent tidal habitats will depend upon the degree of visibility of the work. The retention of the buffer zone vegetation will provide some screening, but there are some gaps in this vegetation, while the height of the buildings, and the raising of ground within the site, will mean that some of the work will be visible above this vegetation. In particular, the proposed apartment blocks in the north-eastern corner of the development site overlook the shoreline and construction work on these apartment blocks may have a high degree of visibility to waterbirds in adjacent tidal habitats. The construction work will take place in phases. This means that at any one time only a section of the development site will have the potential to cause visual disturbance from construction work.

The potential impact of visual disturbance from construction work to waterbirds has been summarised by Cutts et al. (2013) and they provide species-specific buffer distances indicating potential sensitivity to disturbance from construction work. However, while they include buffer distances for most of the SCI species assessed in the NIS, they do not give buffer distances for the four non-SCI species covered by this assessment. Therefore, this assessment the maximum buffer distance given by Cutts et al. (300 m) has been used for a precautionary assessment. This distance has been used to calculate the potential worst-case scenario of displacement impacts on intertidal habitats due to visual disturbance from construction works, taking account of the phasing of the construction work. These calculations assume that there is no screening of construction work so that all activity within the site is visible, the construction work is taking place at the perimeter of the site, and that all birds within the affected distance are displaced.

Table 6.8 shows the estimated displacement impacts, based on the mean percentages of the Ferrycarrig subsite populations of the relevant species in the relevant sectors during the 2015/16 low tide counts (adjusted for the relative area of the sector affected), and the mean percentages of the Wexford Bay populations recorded in the Ferrycarrig subsite during the 2009/10 WSP programme, and assuming that these visual disturbance impacts caused complete displacement of birds from the affected areas. For most species/phases, the potential displacement impact is around 10-20% of the Ferrycarrig population. However despite these relatively high levels, the potential displacement impact to the Wexford Bay populations for the gull species are very small reflecting the very small numbers of these species that occur in the Ferrycarrig subsite. For the other two species, the potential displacement impacts to the Wexford Bay populations are higher (1-4%). Similar calculations for the SCI species indicate that the potential displacement impact varies from less than 1% of the Ferrycarrig population, and less than 0.5% of the Wexford Bay population, for Black-tailed Godwit, to around 8-12% of the Ferrycarrig population and 1% of the Wexford Bay population for Grey Heron and Oystercatcher (see NIS). There are a number of uncertainties in the waterbird data used for calculating these potential displacement impacts. However, as a lot of the construction work will be screened by the retained vegetation and will not, therefore, cause any visual disturbance, and much of the work will be in the interior of the site, the actual displacement impact from visual disturbance is likely to be much less than that indicated in Table 8. Furthermore, while there is no specific information available on the habituation of waterbirds to construction work in Wexford Harbour, given the nature of the area with significant areas of Wexford Harbour adjacent to urban development, it is likely that waterbirds have some degree of habituation and may tolerate visual disturbance at closer distances than those indicated in Table 6.8.

Table 6.8 - Worst-case scenario displacement impact due to visual disturbance from construction works

Species	Buffer distance	Phase	% of Ferrycarrig population displaced	% of Wexford Bay population displaced
Little Egret	300 m	1	14.5%	1.5%
		2	15.0%	1.5%
		3	16.3%	1.6%
		4	15.7%	1.6%
Greenshank	300 m	1	15.0%	4.3%
		2	13.8%	4.0%
		3	14.3%	4.1%
		4	11.5%	3.3%
Herring Gull	300 m	1	13.3%	0.3%
		2	10.4%	0.2%
		3	10.5%	0.2%

Table 6.8 - Worst-case scenario displacement impact due to visual disturbance from construction works				
Species	**Buffer distance**	**Phase**	**% of Ferrycarrig population displaced**	**% of Wexford Bay population displaced**
		4	7.4%	0.1%
Great Black-backed Gull	300 m	1	9.9%	0.1%
		2	9.9%	0.1%
		3	10.9%	0.1%
		4	15.4%	0.2%

Disturbance sensitivity and buffer distances from Cutts et al. (2013). For Grey Heron and Black-headed Gull, which are not covered by Cutts et al., the buffer distance for Curlew has been used, as that is the maximum distance given by Cutts et al.

Impacts to roost sites

There appears to be little information available about the impacts of construction disturbance on waterbird roost sites. Cutts et al. (2013) indicate that roosts may be sensitive to disturbance at distances of over 250 m. However, as discussed above, major construction work at Mutton Island in Galway Bay did not appear to have negative impacts on an adjacent high tide wader roost (Nairn, 2005).

A small high tide roost of greenshank occurs irregularly along the railway line in S3 (about 100-200 m east of the eastern side of the development site) and on the shingle bank at the southern end of S4. Construction work in phase 1 may cause disturbance impacts to this roost. Construction work in phases 2-4 is unlikely to cause disturbance impacts to this roost. The numbers of birds using this roost are very small. Greenshank also roost on the opposite shore at the southern end of S13. Therefore, temporary disturbance to this roost site during construction work would not be likely to significantly affect the high tide roost capacity for this species in Wexford Bay.

Small high tide roosts of oystercatcher and redshank, and daytime cormorant roosts, also occur in the vicinity of the development site (see NIS).

Impacts to subtidal habitat

Birds using subtidal habitats in the Ferrycarrig subsite are generally less likely to be sensitive to disturbance impacts due to the relatively much larger area of subtidal habitat that is available compared to the availability of intertidal habitat. While a small area of subtidal habitat is included within the 55 m construction noise buffer, the area included is so small relative to the overall extent of subtidal habitat (Figure 6) that impacts to species using subtidal habitat from construction noise can be discounted. Visual disturbance impacts could potentially affect somewhat larger areas of subtidal habitat. However, the species that regularly occur in the subtidal habitat adjacent to the development site (herring gull and great black-backed gull) are likely to be relatively tolerant of disturbance impacts. Therefore, any construction disturbance is unlikely to have significant effects on these species.

Cormorant, little grebe and black-headed gull regularly occur in subtidal habitat adjacent to the development site, while little tern could also potentially use this habitat (see NIS).

Impacts from installation of the stormwater outfalls

The above assessments do not include the construction of the stormwater outfalls, where they extend into tidal habitat outside the development site boundary. However, these works will be of very short duration, taking a total of 4-8 days, and will take place in summer. Therefore, any noise and visual disturbance impacts will be very short and will occur outside the main period of occurrence of the waterbird populations, so the impact will not be significant.

Mitigation

The existing buffer zone vegetation will be retained, apart from removal of up to 2m adjacent to the otter fence for construction of retaining walls and the pump station. As the buffer zone is a minimum of 10 m wide, the retained buffer zone vegetation will provide substantial visual screening of the construction works from the adjacent tidal habitats, although raising of ground levels within the site may reduce the effectiveness of the screening. There are some gaps in this vegetation, particularly in the north-east corner of the site. Temporary fencing, or other suitable screening, will be used to fill in these gaps to minimise any visual disturbance to waterbirds from ground level construction activity within the development site.

Operational impacts

Characteristics of impacts

Potential disturbance impacts during the operational phase will be generated by human activity within the site. The main potential disturbance source will be pedestrian activity close to the shoreline. There will be roads/paths within 20 m of the shoreline, while the closest houses to the shoreline will be within 30 m of the shoreline. Existing vegetation and proposed new landscape planting will screen some of the pedestrian activity in these areas from the shoreline.

The ground level within the site will be raised by around 1-2.5 m, relative to the existing height at the development boundary (Table 6.9). However, the existing scrub vegetation along the shoreline is generally tall enough, so that, even with the raised ground levels, it will still screen pedestrians from the immediately adjacent intertidal habitat, although there may be longer distance views over the top of the vegetation in places.

The proposed apartment blocks in the north-eastern corner of the development site overlook the shoreline and the upper stories of these apartment blocks may have a high degree of visibility to waterbirds in adjacent tidal habitats. However, waterbirds using the tidal habitats are unlikely to be very sensitive to visual disturbance from human activity in these apartment blocks due to the vertical separation between the upper stories of the apartment blocks and the tidal habitats.

New landscape planting of trees and shrubs will be carried out on the development side of the otter fence along most of the length of the shoreline apart from a short section at the extreme north-western corner of the site, a section to the west of the new pond, and along the southern half of the eastern shoreline (see landscape masterplan). The proposed otter protection fence at Public Park A along the north western boundary will be extensively planted with hawthorn and mixed native tree species to provide good screening and a protective vegetation barrier.

Public Park D along the northern boundary will be extensively planted with native trees and hawthorn hedgerows to provide buffer to the otter habitat (Landscape Proposals for Carcur P. Nolan and D. Wildes, Landscape Planning and Design Consultancy).

Direct access to the shoreline itself will be prevented by fencing, but it is likely that some level of unauthorized access will take place (e.g., children climbing over fences).

Table 6.9 - Proposed changes in ground levels adjacent to the shoreline

Shoreline	Cross-section	Heights (m)	
		existing level at development boundary	height of path above existing level at development boundary
North	A-A	2.2	2.2
North	B-B	2.4	2.4
North	C-C	1.3	1.3
North	D-D	2.3	2.3
North	E-E	1.7	1.7
North	F-F	2.2	2.2
North	G-G	1.2	1.2
East	H-H	1.2	1.2
East	I-I	0.8	0.8
East	J-J	1.0	1.0

Cross-sections are in clockwise sequence around the shoreline from the north-western corner of the site. The development boundary is the line of the otter fence. All heights taken from Arthur Murphy & Co. Shoreline Sections drawing number PL11 (received 20/07/2020). Where relevant heights were not shown on the drawing, they were read off from scaled measurements.

Impact assessment

Displacement impacts to birds using intertidal habitat

The results of the disturbance study indicate that, in general the maximum distance from the shoreline over which most waterbird species are likely to be disturbed by pedestrian activity within the site is 100-150 m. Therefore, for the four species considered by this assessment, the maximum area of intertidal habitat potentially affected by disturbance impacts from the proposed development can be estimated by applying a 125 m buffer to the development site (Figure 6.7). This buffer would cover all the intertidal habitat within S4 and S5, around 26% of the intertidal habitat within S3, and around 19% of the intertidal habitat within S6 (based on the approximate extent of intertidal habitat exposed at low tide on a moderate spring tide; see Appendix 6.3). The total area of intertidal habitat affected would be around 6 ha. This would represent around 8% of the total area of intertidal habitat within the Ferrycarrig subsite, and 2% of the total area of intertidal habitat in the Wexford Harbour and Slobs SPA (excluding the section upstream of Ferrycarrig Bridge). Based on the mean percentages of the Ferrycarrig subsite populations of these species in the relevant sectors during the 2015/16 low tide counts (adjusted for the relative area of the sector affected), and the mean percentages of the Wexford Bay populations recorded in the

Ferrycarrig subsite during the 2009/10 WSP programme, the potential displacement impact can be estimated as shown in Table 6.10. The potential displacement impact as a percentage of the Ferrycarrig populations was relatively high (8-20%), but, as a percentage of the Wexford Bay population, the potential impact was much lower (0-3%), reflecting the relatively small numbers of these species that occur in the Ferrycarrig subsite. Similar calculations for the SCI species, indicate that the potential displacement impact varies from 1-4% of their Ferrycarrig populations, and is less than 1% of their Wexford Bay populations (see NIS).

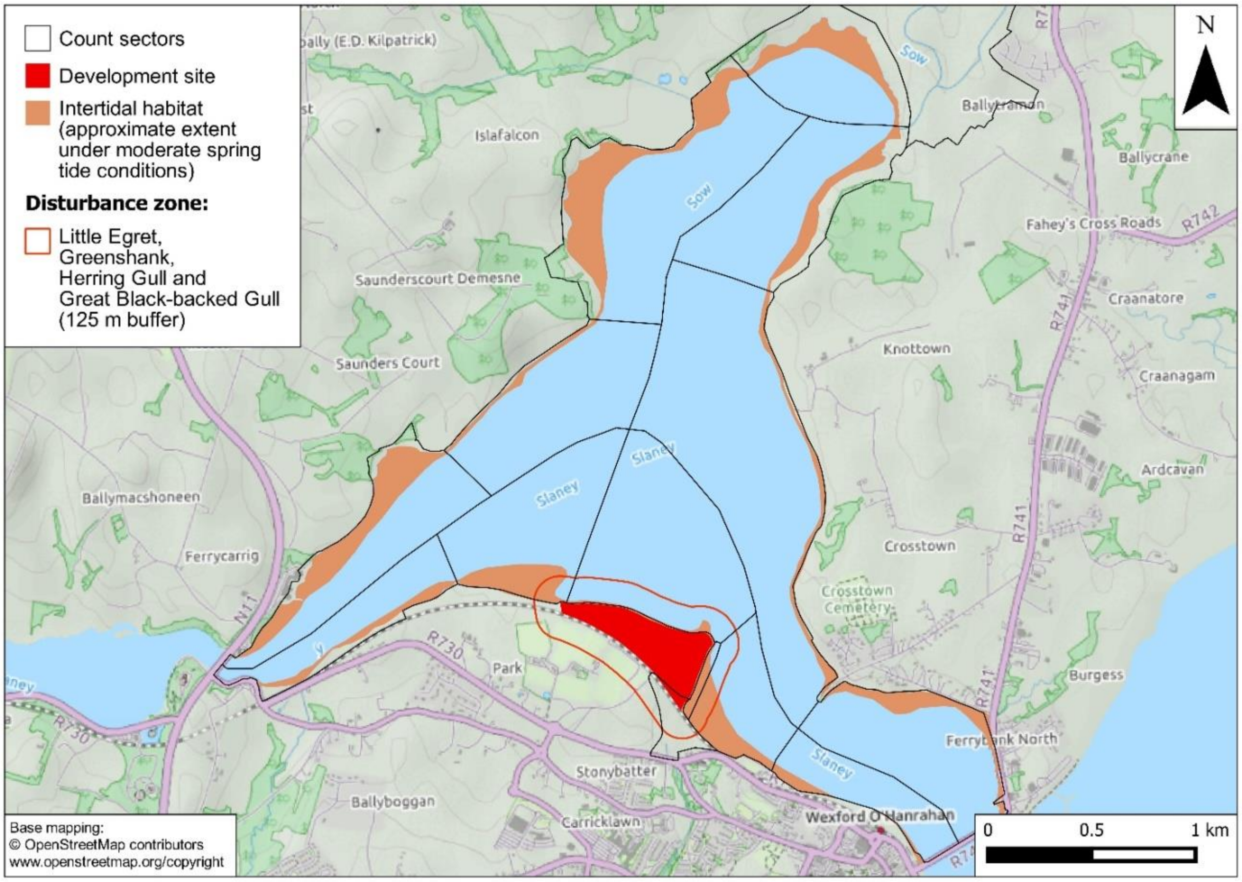
There are a number of uncertainties in the waterbird data used for calculating these potential displacement impacts. However, as the overall scale of the impacts are very small, and taking account of the fact that the WSP dataset will tend to overestimate the percentage occurrence of species in the Ferrycarrig subsite, it can be concluded that, even under the worst-case scenario, the scale of the potential displacement impact will be very small.

Table 6.10 - Worst-case scenario displacement impact due to operational disturbance

Species	Number of birds displaced	% of Ferrycarrig population displaced	% of Wexford Bay population displaced
Little Egret	3.0	20.2%	2.0%
Greenshank	1.7	10.1%	2.9%
Herring Gull	1.2	7.7%	0.2%
Great Black-backed Gull	2.8	8.3%	0.1%

The above calculations represent an unrealistic worst-case scenario. There will not be continuous pedestrian activity along the shoreline, while the existing vegetation and the proposed landscape planting will screen a lot of the activity from the shoreline, when it does occur. Furthermore, given the physical separation of the pedestrian activity from the intertidal zone it is likely that, over time, birds will habituate to the activity and show reduced disturbance distances. Therefore, given the low levels of impact predicted under the unrealistic worst-case scenario, and the factors ameliorating this impact discussed above, it is concluded that the pedestrian disturbance will not cause significant displacement impacts to any of the SCI species using intertidal habitat adjacent to the development.

Figure 6.7. Approximate extent of intertidal habitat potentially disturbed by pedestrian activity within the development site



Energetic impacts to birds using intertidal habitat

Even if birds are not displaced, disturbance could cause energetic impacts through birds stopping feeding and/or temporarily moving/flying away from the disturbance sources. The results of the disturbance study indicate that on most occasions when birds are disturbed in the intertidal habitat around the site, they will fly short distances to adjacent areas along the same shoreline, or to the shoreline opposite the north-east corner of the development site. Therefore, the energetic impact of a single disturbance impact will be minor.

Most of the completed development site will be screened from the adjacent intertidal area by the retained buffer zone vegetation and by additional landscape planting along the inside of the buffer zone. This means that there are only likely to be occasional disturbance impacts from activity within the site and, in combination with the likely minor energetic costs of responses to individual disturbance events, it is unlikely that such activity will cause significant energetic impacts to birds using intertidal habitat adjacent to the site.

There is also likely to be some degree of unauthorized access to the shoreline. If this becomes a regular feature, it is possible that it could cause a measurable degree of energetic impact to birds using this area. However, the displacement calculations above, show that any such energetic impacts would not affect a significant proportion of the Wexford Bay populations of the relevant species.

Impacts to roost sites

A small high tide roost of Greenshank occurs irregularly along the railway line in S3 (about 100-200 m east of the eastern side of the development site) and on the shingle bank at the southern end of S4.

The retained buffer zone vegetation, and the additional landscape planting along the inside of the buffer zone, will provide effective screening of these roost sites. However, any unauthorized access to the shoreline in these areas will cause temporary abandonment of the roost sites on the shingle bank and shingle spit and, if this becomes a regular feature, the roost sites may be permanently abandoned. However, the numbers of birds using these roost sites are very small. The roost on the railway embankment would not be likely to be affected, and these birds also roost on the opposite shore at the southern end of S13. Therefore, the loss of these roost sites would not be likely to significantly affect the high tide roost capacity of the Wexford Harbour and Slobs SPA.

Small high tide roosts of Oystercatcher and Redshank, and daytime Cormorant roosts, also occur in the vicinity of the development site (see NIS).

Impacts to birds using subtidal habitat

Two SCI species that use subtidal habitat were regularly recorded in the sectors adjacent to the development site: herring gull and great black-backed gull. Gull species are generally relatively tolerant of disturbance. Therefore, significant disturbance impacts to these species are not likely to occur.

Cormorant, little grebe and black-headed gull regularly occur in subtidal habitat adjacent to the development site, while little tern could also potentially use this habitat (see NIS).

Mitigation

Fencing will be installed along the inner edge of the buffer zone to prevent regular access from the occupied development to the adjacent shoreline. This will reduce potential disturbance impacts to birds using the shoreline habitats. This fence, and the buffer zone vegetation, will be regularly inspected. Any damage to the fence will be quickly repaired and if evidence is detected of regular access to the shoreline (e.g., trampled paths through the buffer zone vegetation, further measures (e.g., taller, and/or additional, fencing) will be put in place.

Note that as this fence is part of the design of the scheme, it has been factored into the above assessment of potential disturbance impacts (see above). The latter assessment includes consideration of the potential for unauthorised access to take place despite the presence of the fences

Residual impact

The residual impact to waterbirds will not be **not significant**.

Potential Impacts to terrestrial birds

Clearance and development of the site will remove nesting and foraging habitat for a range of common bird species occurring within the site. The boundary hedgerows, treelines along the rail line, reed bed and at least 10 m of scrub habitat will be retained (with the exception of some removal to construct the retaining wall and outfall pipes) at the boundary with the shoreline. This retained vegetation will continue to provide nesting and foraging habitat for some species of birds associated with such habitats.

Construction of the development (on a phased basis) will permanently remove nesting habitat suitable for meadow pipits and foraging habitat for raptor species such as kestrel and buzzards which primarily forage over rough grasslands. Sparrowhawks may persist on site and can occur in parks and larger gardens in urban areas.

Meadow pipit is widespread and extremely abundant in Ireland. It was red-listed because of a severe population decline following the cold winters of 2009/10 and 2010/11, but the population has now recovered to its pre-2009/10 levels[1].

Kestrel is amber listed due to an unfavourable conservation status in Europe. Removal of small areas of habitat for these species is not anticipated to have a significant impact on their conservation status.

Overall the bird interest on the site is evaluated as of low local importance given the presence and predicted occurrence of populations of birds which are widespread and common species that do not represent populations of specific conservation importance that require site-specific conservation measures.

Depending upon the size of the population, any breeding reed warbler population that occurs around the Ferrycarrig subsite may be of national or county importance. Any breeding reed warbler population occurring in the reed bed adjacent to the site will not be impacted on by the development as there is minimal incursion onto this habitat by the development limited to the construction of a 2 m length of outfall pipeline to the reed bed.

The pre-mitigation impact to the terrestrial birds on site is anticipated to **slight negative at the local scale**.

Mitigation

- Site clearance will take place outside of the breeding season (which occurs March 1st to August 31st) to avoid direct injury and disturbance to breeding birds. If this is not possible then a breeding bird survey will be carried out on any areas to be cleared and site specific mitigation measures put in place in consultation with the NPWS and appropriate licensing will be sought if necessary in to ensure compliance with the Wildlife Act 2000 (as amended).

[1] Countryside Bird Survey online population trends for the Republic of Ireland, accessed through https://birdwatchireland.ie/our-work/surveys-research/research-surveys/countryside-bird-survey/, accessed 24th July 2020.

- Retention of hedgerow and scrub along the boundaries of the site will retain a significant portion of habitat suitable for terrestrial bird species.
- The landscaping plan provides for native hedgerow and tree planting which in time as they mature will provide nesting habitat and forage for some bird species.
- The landscaping plan provides for areas of wildflower meadows which will provide cover and a foraging source for some bird species.
- In time, gardens associated with the development are expected to provide suitable habitat for some garden bird species.

Residual impact

The residual impact on terrestrial bird species is anticipated to be **not significant.**

Potential impacts to bat species

Common pipistrelle, soprano pipistrelle, long-eared bat and Leisler's bats are the most likely bat species to occur in and around the site. Bats are anticipated to use the boundary vegetation for foraging and commuting and may forage within the site over the small area of woodland on site or over the grassland and recolonising bare ground habitats.

The boundary vegetation will be retained and enhanced with native planting and will continue to provide suitable commuting and foraging habitat for bats.

The proposed lighting scheme has been designed using directional LED lighting avoiding excessive illumination of the boundary habitats. The external lighting and lux level layout (document W1810-MES 1001; Douglas Carroll Consulting Engineers) illustrates the resulting lux levels at the boundary of the built land element of the development. In general, at the outer boundary of the perimeter road, lux levels are low ranging between approximately 1.4 to 4.9 lux. These levels are for the outer boundary of the road and would decrease further with distance from the light source towards the boundary vegetation**.**

Therefore there is no significant impact anticipated to bats using the boundary habitats of the site.

Clearance of the internal area of the site will result in the removal of approximately 10 ha of potential bat foraging habitat. Usage of the internal area of the site as a foraging resource is anticipated to be limited as the woodland habitat is very small and the remainder of the site composed mostly of recolonizing bare ground is of recent origin and does not present as very suitable bat foraging habitat.

This loss of foraging area is not anticipated to have a significant impact on the conservation status of the local bat population and the loss of foraging habitat is anticipated to have a slight negative impact on bats at the local scale.

There is low risk of direct harm to bats as a result of site clearance. There are no suitable features or buildings on the site to support large bat roosts. There is very low potential for the trees on site to support bat roosts as there are no very mature trees on site. The buildings on site are small, the ceiling was missing from the small cottage and the attic space visible. No signs of bats were observed in the buildings during site surveys. It is possible that they could be used as temporary day roosts on occasion. Therefore there is a low risk of potential direct harm to bats during site clearance.

Pre-mitigation, construction and security lighting could also have a temporary negative impact on bats if the boundary vegetation is illuminated.

Mitigation to avoid disturbance to bats

- Prior to site clearance, a pre-construction bat roost survey of buildings and trees scheduled for removal will take place to inform site specific mitigation measures to reduce or avoid impacts to bats during site clearance. The bat survey methodology should have regard for Bat Surveys: Good Practice Guidelines, 3rd edition, Bat Conservation Trust (Collins, 2016) and the *Bat Tree Habitat Guide* (BTHG 2018).
- A precautionary working methodology will be implemented under derogation licence if necessary during tree felling under the supervision of the project ecologist to avoid direct harm or significant disturbance to bat roosts
- To mitigate the loss of potential roost features bat boxes (2F Schwegler Bat Box or similar woodcrete boxes**)** should be installed in the retained trees at the margins of the site. The number and location of bat boxes should be determined by the project ecologist dependant on the results of the preconstruction surveys and the availability of suitable retained trees for the installation of bat boxes.
- During construction, security and construction work lighting will be set up to avoid illumination of the boundary vegetation and will follow guidelines:
    - Guidance Notes for the Reduction of Obtrusive Light GN01 (Institute of Lighting Professionals, 2011)
    - Bats & Lighting - Guidance Notes for Planners, Engineers, Architects and Developers (Bat
      Conservation Ireland, December 2010)
    - Bats and Lighting in the UK – Bats and the Built Environment Series, Bat Conservation Trust UK

Residual impact: The residual impact will be a **slight negative impact at the local scale** on bat species due to the loss of foraging area within the site.

Potential impacts to other mammals

The development will remove scrub and grassland areas within the development site that are suitable for protected small mammals such as hedgehogs, pygmy shrews, and stoat and unprotected mammals such as fox. The populations of these small mammals has been evaluated as of low local value. The retention of scrub, treelines and hedgerow along the boundary of the site will retain habitats that are suitable for these species. A small population of small mammals such as hedgehogs, pygmy shrews, and wood mouse are likely to return and coexist within the development site in parkland areas and gardens. Fox are known to persist in urban areas.

The impact to these mammal populations is anticipated to be **not significant.**

Potential impacts to common lizard

Common lizard individuals and their resting/breeding places are protected from disturbance or damage under the Wildlife (Amendment) Act 2000. The common lizard is listed as a species of Least Concern on the current red list of fish, reptiles and amphibians. Lizards are considered to be widespread and there is no evidence of significant decline (King et al., 2011)

The lizard population on site is anticipated to be of high local value. Several habitats on site are of value to lizards including areas of scrub, exposed sand and gravel and unmanaged grasslands. The development will result in the loss of approximately 10 ha of habitat suitable for lizards. Suitable habitat for lizards will be retained at the boundary of the site within the otter habitat and the boundary vegetation along the rail line.

As the development is phased, lizards are likely to be displaced westwards retreating to the undeveloped areas of the site and towards the boundary vegetation retained. Loss of habitat will be partial as lizards are expected to repopulate the area to some extent once the development is complete.

The landscaping design for the development incorporates features suitable as habitat for lizards.

The impact to lizards is expected to be a significant negative impact at the high local scale.

Mitigation:

Landscaping proposals include features specifically included to provide suitable habitat for lizards.

- Wildflower meadow areas to provide long grass and tussocks for basking and a source of insect prey
- Varied topography to provide south facing surfaces for basking
- Rocky outcrops and gabion baskets to seating to provide hibernacula and basking sites
- South facing sand and gravel embankment to provide basking sites
- Hedgerow planting to provide areas of shelter
- Gardens are expected to provide some resources for lizards

Residual impact

The residual impact to the common lizard is anticipated to be a **moderate negative impact at the local scale.**

Potential Impacts to common frog

Common frog individuals and their resting/breeding places are protected from disturbance or damage under the Wildlife (Amendment) Act 2000.

The common frog population on site is predicted to be very low due to lack of suitable habitat and spawning sites and potential impacts to common frog population are not considered significant. However, common frog, protected under the Wildlife Act 2000 (as amended), may spawn in wet temporary pools within the development site. In many cases these may dry out before the tadpoles have completed their development. Site clearance and construction works could potentially remove or damage such spawning sites.

Mitigation to avoid harm to common frog

Should site clearance or construction works occur during the breeding season for frogs (January-May) then a survey of the affected areas will be carried out and mitigation measures implemented in consultation with the NPWS to avoid harm to the species and to translocate the frog spawn under licence to the pond.

The creation of the new freshwater pond will provide spawning habitat for common frog that will be more suitable than any of the existing potential spawning habitat within the site.

Residual impact

The residual impact to the common frog is anticipated to be a positive impact.

Potential impacts to Invertebrates

The invertebrate fauna of the development site is evaluated as of high local importance (primarily due to the likely presence of a diverse range of bees, butterflies and other species associated with early successional habitats) indicated by the floral diversity on site and the presence of suitable nesting habitat for a range of insect species.

Loss of the recolonizing bare ground habitat (ED3) and exposed sand and gravel (ED1) habitats will have a negative impact on invertebrates due to loss of feeding resources and nesting habitat. Suitable nesting habitat was observed to occur in the sand and gravel habitat (ED1). The total area of sand/gravel habitat is 2500m^2 but not all of this habitat is suitable as nesting habitat and the habitat was subject to disturbance by quad bike riding. This loss of this habitat would result in a significant negative impact at the high local scale to invertebrate species.

Mitigation:

- Sand and gravel will be saved and used to create a sand and gravel embankment (approximate area 693m^2) along the northern boundary at the west end of the site. The location of the embankment is shown on the landscaping plan and in Fig. 6.7 above. This embankment will provide a south-facing aspect suitable for nesting solitary bees and other insects. Further areas of gravel banks will be created around the pond (139.9 m^2). The total area of sand/gravel habitat created will be approximately 833m^2 Public access to these embankments will be prevented by the boundary fence but access by way of a locked gate will be provided for maintenance
- Wildflower meadow areas will provide some suitable foraging resources.
- Native hedgerow and tree planting will provide additional nectar sources for pollinating insects.
- Flower beds and borders within the landscaping and gardens of the development will provide additional feeding resources for insects.

Residual impact

The residual impact to invertebrates is anticipated to be a moderate negative impact at the local scale primarily due to a reduced area of foraging habitat and nesting habitat for invertebrates.

Impact on adjacent habitats (not assessed in NIS)

Shingle and gravel shores (LS1)/ Annual vegetation of drift lines (1210)

Construction of 4 of the 5 outfall pipes will traverse the shingle and gravel shores to the north of the development site. There will be localised disturbance due to excavation of the shingle and gravel shores to install the pipe. This habitat may contain patches of the Annex I habitat Annual vegetation of drift lines (1210).

Shingle and gravel shores with patchy distribution of vegetation July 2020

Drift lines occur on sandy or shingle substrate at the upper part of the strand, around the high tide mark. Water-borne material including organic matter is deposited on the shore and provides nutrients and a seed source for vegetation. The vegetation predominantly consists of annual species, such as orache species (*Atriplex* spp.), sea rocket (*Cakile maritima*) and prickly saltwort (*Salsola kali*), which are highly specialised to deal with the harsh conditions of high salinity, wind exposure and drought. This habitat is generally very species-poor and fragmented, and tends not to occupy large areas due to its narrow, linear nature. It exists in a state of instability and may be absent in some years due to natural and/or anthropogenic causes. In Ireland, the habitat includes drift line vegetation on sandy substrates as well as drift line vegetation on shingle (NPWs, 2019a).

Annual vegetation of drift line (1210) is not a qualifying interest of the Slaney River Valley SAC. A survey of the shoreline in July 2020 established that the cover of vegetation on the gravel shore to the north of the is sparse and patchy and in some locations absent all together depending on the degree of local disturbance and inundation of the high tide.

The disturbance of this habitat will be localised. This is not anticipated to result in a significant impact due to the fact that the disturbance will be restricted to localised stetches of a maximum 10 m width at 4 locations along the northern shoreline. It should be noted that the vegetation is not continuous along the shore and consists of a patchy distribution of occasional plants within a 1 m line along a narrow shoreline. Displaced sand and shingle will be replaced immediately after installation of the pipeline and the habitat is expected to recover over the course of 1-2 growing seasons. The characteristic species of the habitat are annual species and are anticipated to recolonise naturally and readily from the local seed source. No long term significant effect is anticipated.

Oak-ash-hazel woodland (WN2)

The area of oak-ash-hazel (WN2) woodland at the western end of the development site is within the boundary of the SAC and therefore is evaluated as of international value. This is not an Annex 1 habitat. There will be no loss of this woodland habitat area. Potential impacts include deterioration of the habitat due to the woodland potentially being accessed as an amenity and littering or dumping of garden waste into the woodland. However the design of the development incorporates features which will discourage such activities:

- The woodland will be fenced off by the boundary fencing and therefore the woodland will not be accessible to the public.
- Dumping of garden waste or litter will be discouraged by the fact that no gardens back onto the woodland and the boundary fencing will prevent access.

Therefore no significant impact is anticipated.

Reed and large sedge swamp (FS1)

An area of reed swamp dominated by common reed (*Phragmites australis*) within the boundary of the SAC is evaluated as of international importance. One surface water outfall pipe will be installed into the reedbed for a length of 2 metres. This will result in localised vegetation removal/disturbance for a 10 m wide strip equating to $20m^2$.

No significant negative impact to the reed swamp are anticipated as a result of this construction impact. The area of habitat affected is very small and insignificant. The habitat is anticipated to recover very quickly (within 1-2 growing seasons) from this disturbance due to the ability of the component vegetation to spread vegetatively though its extensive system of rhizomes and stolons and also by seed. Retention of the scrub vegetation between the development and the reed swamp is provided for in the design of the development. The otter boundary extends along the scrub marginal to this area of reed bed.

No significant negative impact to the reed swamp is anticipated.

Summary of impact assessment

Table 11 summarises the ecological impacts, mitigation measures and residual effects of the development. The significance of the impacts have been categorised using the impact significance terminology defined in Table 3.3 of the EPA Guidelines (EPA, 2017). None of the predicted residual impacts are categorised as significant, very significant or profound.

Table 6.11 Summary of ecological impacts, mitigation measures and residual effects

Ecological feature	Approx. length /area	Impact pre-mitigation	Mitigation	Residual Impact
Designated sites				

Table 6.11 Summary of ecological impacts, mitigation measures and residual effects				
Ecological feature	**Approx. length /area**	**Impact pre-mitigation**	**Mitigation**	**Residual Impact**
Slaney Valley SAC		Significant negative	Retention and protection of otter habitat Creation of new pond Protection of water quality	Not significant
Wexford Harbour and Slobs SPA		Not significant	Retention and enhancement of boundary vegetation.	
The Raven SPA		Not significant	Retention and enhancement of boundary vegetation.	
Forth Mountain pNHA		No impact		
On site habitats				
Recolonising bare ground ED3	4.2 ha 1 ha of which is evaluated as of low local value	Significant negative, low local scale	Preconstruction botanical survey Translocation of any rare plants found pre-construction if necessary Creation of wildflower meadow in landscaping plan	Moderate negative low local scale
Exposed sand, gravel ED1	25 ha 0.12ha of area where rare plant occurs	Significant negative, high local scale	Sand and gravels saved Creation of sand and gravel embankment	Not significant
Hedgerow adjacent/within SAC (WL1)	1000 m	No significant impact. Possible damage to tree roots and	Retention of habitat Enhancement of habitat with tree	Positive impact

Table 6.11 Summary of ecological impacts, mitigation measures and residual effects				
Ecological feature	**Approx. length /area**	**Impact pre-mitigation**	**Mitigation**	**Residual Impact**
		vegetation during construction of retaining wall	and hedgerow planting	
Pond (FL8)	300 m2	Significant negative high local scale (due to removal of otter habitat)	Construction of new pond (297 m2) Planting of vegetation buffer Fencing of habitat	Positive local impact
Scrub (WS1)	3.7 ha	Slight negative local scale	Sensitive site clearance Tree and hedgerow planting	Not significant
Wet woodland (WN6)	0.35 ha	Not significant		
Oak-ash-hazel woodland (WN2	0.36 Ha	Not significant		
On site species				
Notable flora		Significant negative high local scale	Preconstruction botanical survey Sand and gravel saved and reused to create embankments	Not significant
Bat species		Slight negative local scale	Pre-construction bat survey to inform site specific measures to avoid injury to bats Sensitive lighting design	Slight negative local scale
Terrestrial birds		Slight negative, local scale (lower value)	Retention and enhancement of	Not significant

Table 6.11 Summary of ecological impacts, mitigation measures and residual effects				
Ecological feature	**Approx. length /area**	**Impact pre-mitigation**	**Mitigation**	**Residual Impact**
			boundary vegetation Sensitive site clearance Landscaping design and gardens	
Common lizard		Significant negative, high local scale	Wildflower areas Hedgerow planting Habitat creation including hibernacula and basking areas within the landscaping	Moderate negative impact local scale
Common frog		Not significant	Sensitive site clearance to avoid disturbance to frog spawn Creation of new pond	Slight positive impact local scale
Invertebrates		Significant negative high local scale	Creation of sand/gravel embankment Wildflower meadow areas Hedgerow planting Landscaping flower beds	Moderate negative local scale
Adjacent habitats (not assessed in NIS)				

Table 6.11 Summary of ecological impacts, mitigation measures and residual effects				
Ecological feature	**Approx. length /area**	**Impact pre-mitigation**	**Mitigation**	**Residual Impact**
Oak-ash-hazel woodland		No impact anticipated	Fencing of woodland from development Orientation of houses	
Shingle shore (Annual vegetation of drift lines)		No significant impact		
Reed and large sedge swamp		No significant impact		

6.5 Post construction monitoring

Post construction monitoring of the local otter population and monitoring of the recolonisation of the recreated sand gravel habitat and invasive plant species will be required.

Following completion of each phase of development it is proposed to monitor the otter population at the boundary of the site. The method and programme of monitoring will be drawn up and agreed with the NPWS. It is proposed to monitor the population for at least 3 years following completion of each phase of the development. Depending on results monitoring for longer may be required.

Post construction monitoring will be implemented to monitor the establishment of vegetation on the compensatory sand/gravel (ED1) habitat created. Monitoring will include botanical surveys to record the frequency and diversity of plant species growing on the sand/gravel habitat and to compare with the baseline data recorded in pre-construction surveys. It is proposed to monitor the habitat at year 1, 3 and 5 following the completion of the creation of the habitat. An outline habitat management plan is provided in Appendix 6.7.

Post construction monitoring for the presence of invasive plant species will be implemented as part of an invasive plant species management plan.

6.6 Summary of mitigation and monitoring measures

A project ecologist will be appointed to the project during all construction phases to oversee the implementation of the mitigation measures incorporated into this development.

Mitigation measures by design or otherwise are included in the NIS which address any potential impacts to the Slaney River Valley SAC and the Wexford Harbour and Slobs SPA and The Raven SPA. These mitigation measures will be implemented in full. These mitigation measures are detailed in the NIS and are summarised below along with additional measures to mitigate potential impacts to other species.

Prevention of pollution water courses

Prior to development commencing, detailed construction method statements will be drawn up and agreed with NPWS and Inland Fisheries Ireland (IFI). The construction method statements will include:.

- A construction management plan including a specific methodology with associated drawings to contain soil and sediments on site and prevent construction site runoff has been drawn up for all phases of the development. It is proposed to construct a temporary 1 m high berm with 1 in 3 side slope along the full length of the eastern and northern boundary of the site to prevent escape of silty water to the estuary and guide it to temporary siltation ponds as outlined in engineering drawing PL12.
- The appointed contractors both for infilling the site and for construction will be required to develop and implement site-specific construction method statements for the protection of water quality which will be approved by Inland Fisheries Ireland and/or the NPWS
- Best practice construction methodology to minimise damage to the otter habitat at the boundary of the development during construction of the retaining wall, site infilling or construction

Mitigation of potential habitat loss and disturbance to otter and wintering birds during the construction and operational phases

- Prior to development commencing, a new freshwater pond will be constructed in the northeast corner of the site. The pond will be monitored and use of the pond by otters confirmed prior to infilling of the existing pond.
- Prior to site infill a method statement outlining protection of the otter habitat during construction of the retaining wall will be drawn up and approved by NPWS
- Prior to construction commencing, a preconstruction otter survey will take place to identify any changes in otter activity and holt locations since the otter survey. The preconstruction survey will take place no more than 10-12 months in advance of construction.
- This preconstruction otter survey will be supplemented by a further inspection of the development area, immediately prior to site clearance to ensure that no new holts have been created in the intervening period and to check if any of the previous identified potential holts are in active use by breeding females or have otter cubs present.
- The preconstruction otter survey will inform site-specific measures to avoid disturbance to otter at the time of construction following NRA guidelines *The Treatment of Otters Prior to the Construction of National Road Schemes* (NRA, 2006) and other guidance as relevant.

- Prior to construction, temporary fencing will be established along the shoreline at the retaining wall which borders the otter habitat. Security fencing will be erected around each phase to prevent access to undeveloped lands and the shoreline.
- Security and construction work lighting will be set up to avoid illumination of the otter habitat and the shoreline habitats and will follow guidelines:
  - Guidance Notes for the Reduction of Obtrusive Light GN01 (Institute of Lighting Professionals, 2011
  - Bats & Lighting - Guidance Notes for Planners, Engineers, Architects and Developers (Bat
    Conservation Ireland, December 2010)
  - Bats and Lighting in the UK – Bats and the Built Environment Series, Bat Conservation Trust UK
- The completed development will be permanently fenced along the boundary with SAC/SPA, including the shoreline, reedbed and woodland within the SAC, preventing public access by people or dogs.
- The vegetation at the boundary of the development will be enhanced by native planting to increase the screening effect of the shoreline habitats by the existing vegetation.

Mitigation measures to prevent the spread of invasive plant species

An invasive plant species management plan will be drawn up and implemented by an invasive plant species specialist to treat and prevent the spread of the invasive plants species on site.

Mitigation of the loss of habitats and flora on site include:

- A pre-construction botanical survey will be carried out between May and September to re-survey the site for the occurrence of rare and/or protected flora. Should any protected flora or additional records for rare species be found, appropriate mitigation will be devised in consultation with NPWS and under licence if required to translocate the species to suitable receptor sites within or adjacent to the development site.
- The pre-construction botanical survey will record the frequency and diversity of all plant species in the sand and gravel habitat as baseline data prior to removal of the habitat.
- Prior to infilling or clearance of the site, sand and gravel from the exposed sand and gravel (ED1) habitat on site will be excavated and the soils saved and used to create a sand and gravel flat area with a south facing embankment adjacent to the northern boundary of the development and around the otter pond to create replacement to create replacement sand and gravel habitat.
- These areas will be fenced off from the development site preventing disturbance to the habitat. The habitat will be maintained annually by a 3 year cycle of rotational strimming and removal of the vegetation and manual disturbance by light scarification to prevent encroachment by scrub species. Maintenance of the habitat will be incorporated into the landscaping management plan.
- The landscape plan includes planting of native hedgerows and trees along the boundary of the site to enhance the boundary vegetation.

- The landscape plan includes planting of native and non-native hedgerow and trees species within the amenity and parkland areas within the development

Mitigation of potential impacts to bat species.

- Prior to site clearance, a pre-construction bat roost survey of buildings and trees scheduled for removal will take place to inform site specific mitigation measures to reduce or avoid impacts to bats during site clearance. The bat survey methodology should have regard for Bat Surveys: Good Practice Guidelines, 3rd edition, Bat Conservation Trust (Collins, 2016) and the *Bat Tree Habitat Guide* (BTHG 2018).
- A precautionary working methodology will be implemented under derogation licence if necessary during tree felling under the supervision of the project ecologist to avoid direct harm or significant disturbance to bat roosts
- During construction, security and construction lighting will be sensitive to prevent illumination of the otter habitat and shoreline habitats during construction which will also avoid illumination of retained bat habitat at the boundary of the site.
- To mitigate the loss of potential roost features bat boxes (2F Schwegler Bat Box or similar woodcrete boxes) should be installed in the retained trees at the margins of the site. The number and location of bat boxes should be determined by the project ecologist dependant on the results of the preconstruction surveys and the availability of suitable retained trees for the installation of bat boxes.
- The proposed lighting scheme is designed to ensure that the lighting around the perimeter of the development is directional to prevent overspill onto the shoreline and treeline habitats along the rail line.

Mitigation for terrestrial birds

- Site clearance and/or infilling of the site, will take place outside of the breeding season (which occurs March 1st to August 31st inclusive) to avoid direct injury and disturbance to breeding birds. If this is not possible then a breeding bird survey will be carried out on any areas to be cleared and site specific mitigation measures put in place in consultation with the NPWS to ensure compliance with the Wildlife Act 2000 (as amended).
- Retention of hedgerow and scrub along the boundaries of the site will retain a significant portion of habitat suitable for terrestrial bird species.
- The landscaping plan provides for native hedgerow and tree planting which in time as they mature will provide nesting habitat and forage for some bird species.
- The landscaping plan provides for areas of wildflower meadows which will provide cover and a foraging source for some bird species.
- In time, gardens associated with the development are expected to provide suitable habitat for some garden bird species.

Mitigation for lizards

Landscaping proposals include features specifically included to provide suitable habitat for lizards.

- Wildflower meadow areas to provide long grass and tussocks for basking and a source of insect prey.
- Varied topography to provide south facing surfaces for basking.
- Rocky outcrops to provide to provide hibernacula and basking sites.
- South facing sand and gravel embankment to provide basking sites.
- Hedgerow planting to provide areas of shelter.
- Gardens are expected to provide some resources for lizards.

Mitigation measures for invertebrates

- Sand and gravel will be saved and used to create a south-facing sand and gravel embankment along the northern boundary of the western portion of the site. An additional area of sand and gravel banks will be created near the new pond. These areas will be fenced off from the development site preventing disturbance to the habitat. The habitat will be maintained annually by a 3 ear cycle of rotational strimming and removal of the vegetation and manual disturbance by light scarification to prevent encroachment by scrub species.
- Wildflower meadow areas incorporated into the amenity areas of the development will provide suitable foraging resources.
- Native hedgerow and tree planting will provide additional nectar sources for pollinating insects.
- Flower beds and borders within the landscaping and gardens of the development will provide additional feeding resources for insects.

Post-construction monitoring

Post construction monitoring will be implemented to monitor the local otter population adjacent to the site and recolonisation of the sand and gravel habitat created and for the presence of invasive plant species as detailed Section 6.5 above.

6.7 In combination' effects

In combination or cumulative effects of this development with other developments were assessed with reference to planning applications granted in the last 5 years in the vicinity of the development and the Wexford Town and Environment Development Plan 2009-2015 (as extended).

Development plan zoning

Carcur Park lies in development zone 4 and the land is designated for mixed use residential development. South of the development site there are areas of similar size or larger than the development site designated for community use (the sport playing fields), low residential development and open space and amenity. The open space and amenity area is adjacent to the saltmarsh area located to the southeast of the development site. A coastal walk is proposed between these areas and the railway line. There is also land zoned for open space and amenity west of the development site.

Coastal walks

The development of coastal walks has the potential to cause disturbance impacts to waterbirds and otter. However, the routes identified in the Wexford Town and Environs Development Plan 2009-2015 (Figure 8) are all either in areas with existing coastal access (Ferrybank-Ardcavan shoreline and Wexford Town), or in areas with narrow intertidal zones and low waterbird utilisation (shorelines east of Ferrycarrig Bridge and north of Crosstown) where any disturbance impacts are not likely to affect significant numbers of waterbirds.

No access to the shoreline will be provided within the development site. However, footpaths and cycling paths within the development site may link with other coastal walk if proposals proceed. Within the development site, the use of the footpaths and cycling paths as part of a coastal walk would not be anticipated to result in additional disturbance impacts to wintering birds or otter as the fence will prevent direct access to the shoreline and the boundary vegetation will visually shield the activity from the shoreline.

Proposed future bridge crossing of the River Slaney

There are proposals for a third river bridge crossing at Park using the proposed access roads for this development. This bridge development could pose cumulative impacts to wintering birds and otter near the site. No detailed design is available for the design or layout of this bridge therefore comprehensive analysis of the cumulative impacts of this bridge could not be undertaken. However, the new pond for otter will be located out of the line of this proposed bridge. The proposed bridge location is at a point where there are only narrow bands of intertidal habitat on either shore. Therefore, any direct impacts on intertidal habitat will be minimal.

The construction of the bridge will cause disturbance impacts to waterbirds, and the scale of these impacts is likely to be substantially higher than the disturbance impacts associated with construction work within the Carcur Park site due to the fact that the construction work for the bridge will take place within the tidal habitats. However, the disturbance impacts from the bridge construction work would only have cumulative impacts in-combination with the disturbance impacts from development of the Carcur Park site if construction work for both projects took place at the same time. Waterbirds generally habituate to regular traffic activity, so operation of the bridge is unlikely to have significant disturbance impacts. Similarly disturbance impacts to otter due to construction of the new bridge would only have cumulative impacts if the construction schedules for both projects overlap. The operation of the new bridge and the potential impacts to otter would depend on the design of the bridge. The proposed bridge development will be subject to Appropriate Assessment on the possible impacts of the bridge on the Natura sites and this process would likely influence the design of the bridge to avoid significant impacts.

Trinity Wharf

The Trinity Wharf project comprises the development of a mixed-use urban quarter redevelopment on a brownfield site at the southern end of the Wexford Quays.

The assessment on biodiversity in the EIAR for the Trinity Wharf Development did not identify any significant residual effects following application of the proposed mitigation measures.

The area of estuarine and tidal mudflat habitat loss does not represent a significant portion of the total estimated area of these habitats within the River Slaney/Wexford Harbour waterbody and will not affect the integrity of the Slaney River Valley Special Area of Conservation (SAC) or the Wexford Harbour and Slobs Special Protection Area (SPA).

Post mitigation there was no significant residual impact to fish species or marine mammals. No significant residual impact to otter was anticipated

No terrestrial habitats on the Trinity Wharf site were identified as key ecological receptors due to their evaluation of local importance. Key ecological receptors (other than the features of the SAC and SPA) included bat species and passerine bird species.

No significant residual impact to bat species was identified. Habitat loss as a result of lighting and vegetation removal will constitute a permanent slight negative impact at the local scale.

No significant residual impact on birds at any scale was anticipated.

The potential for spread of invasive plant species including Japanese knotweed and three-cornered leek was also identified but with the implementation of an invasive species management plan no significant impact was anticipated.

In addition to mitigation of the likely ecological effects on the proposed development, the biodiversity assessment also proposed a number of ecological enhancement measures aimed at having a positive impact on ecology including a landscape plan incorporating pollinator friendly trees and shrubs and a wildflower meadow, the installation of bird nest boxes, blue-green roofs

Both developments identify a slight negative impact to bat species at the local scale due to vegetation removal and lighting impacts. The cumulative impacts to bat species of both development is therefore estimated to be moderate negative impact at the locale scale.

The EIAR and NIS for the development (Roughan & O'Donovan, 2019a, b) did not predict any significant impacts to waterbirds from the development, and found that the scale of any impacts would be very minor. This was mainly due to the very small numbers of waterbirds that occur adjacent to the site. In addition, the location of the development means that waterbirds using the adjacent tidal habitats will already be habituated to a high level of disturbance. As the predicted impacts from both this development, and from the Carcur Park development, to waterbird populations are very small, the cumulative impact of the impacts from the two developments in-combination will not be significant.

Other development

Development zones 1, 2 and 3 are located on the northern bank of the river. Zone 1 (Ardcavan) provides for open space and amenity use along the coastal section, with land for long term development identified adjacent to this along with land designated for commercial/mixed use. Zone 2 at Crosstown provides for medium scale residential development, lands for community use and coastal land for open space and amenity. Zone 3 at Ferrybank provides for medium scale residential development and commercial/mixed use development along with smaller areas of open space and amenity including a coastal walk along the coastline.

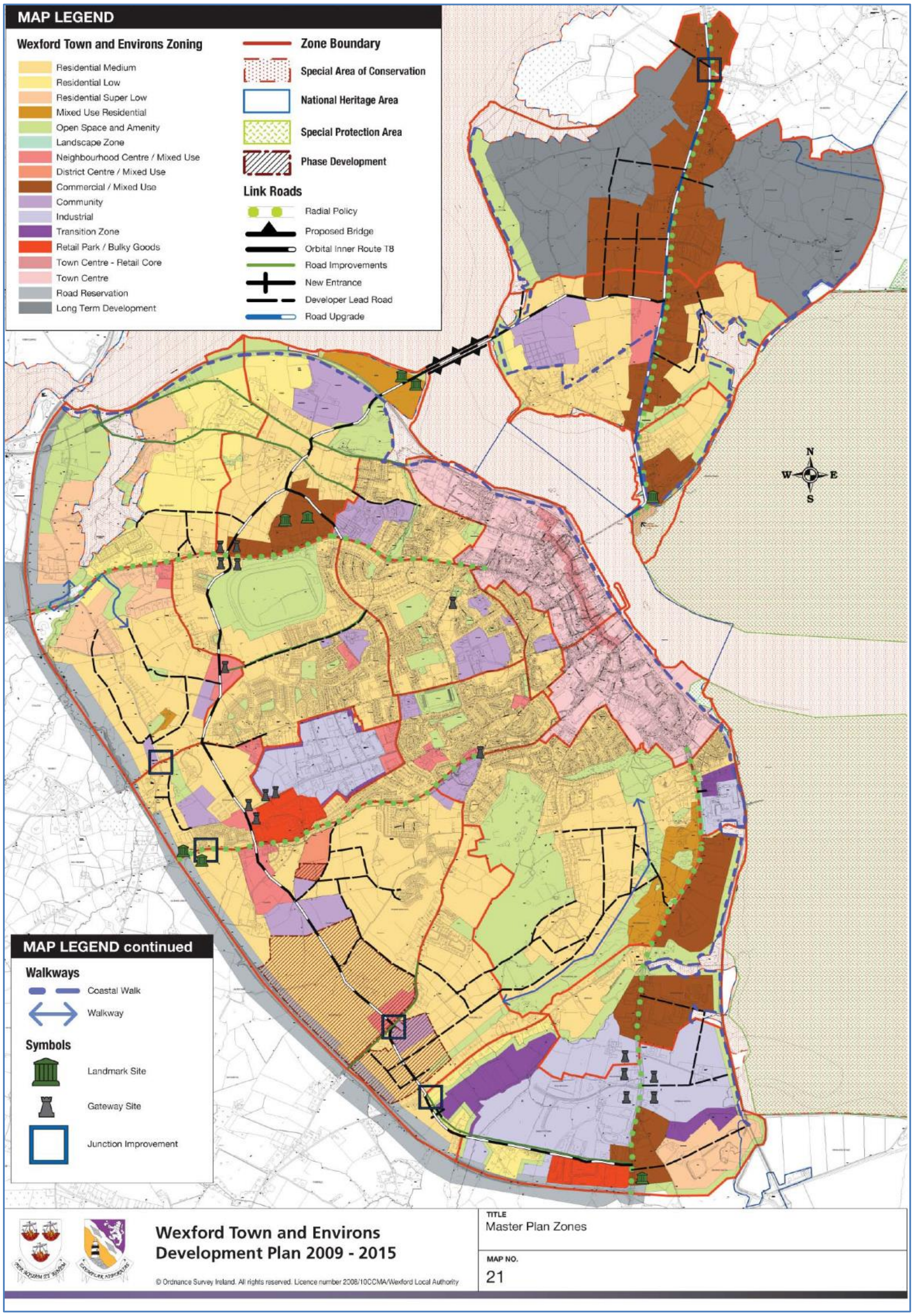
Development zone 5 is west of zone 4 and incorporates the lands of Ballyboggan and Newtown. This area is also adjacent to the Slaney River. Along the coast in this zone the land is designated as open space and amenity as far Ferrycarrig Bridge. South of the coastal zone the lands are designated as commercial/mixed use and also for super low residential use.

In summary, the Wexford Town and Environs land use zoning indicates that for the most part the coastal areas of land are zoned for open space and amenity which would suggest that the area will not be subject to cumulative pressure from development. Open space and amenity zones relates to both public and private land. The council will not normally permit development in this zone that would result in the loss of established open space (zoning objective E Chapter 10 Wexford Town and Environs development plan 2009-2015 as extended).

Chapter 8 states that it is the overall aim of the Council will be to promote a reasonable balance between conservation measures and development measures in the interests of promoting the orderly and sustainable development of Wexford Town.

Natural heritage policy (NH7) is to “prohibit development which would damage or threaten the integrity of sites of international or national importance, designated for their habitat/wildlife or geological/geomorphological importance including the proposed Natural Heritage Areas, candidate Special Areas of Conservation, Special Protection Areas, Ramsar sites and Statutory Nature Reserves”.

Figure 6.8. Development plan zoning for Wexford Town and Environs (Reproduced from Wexford Town and Environs Development Plan 2009-2015 as extended)



Planning applications for the last 7 years from 2012 to July 2020 in the vicinity of the River Slaney north of Wexford Bridge including the areas of Park, Crosstown, Ferrybank North and South and Ferrycarrig were reviewed using Wexford County Council online Planning Map Viewer. Planning permissions granted (other than Trinity Wharf discussed above) are shown in the Table 6.12 below. Planning permissions granted are all small developments including 2 new dwellings, extensions to existing dwellings or buildings and sports club facilities. Installation of tennis court flood lights at Wexford Tennis Club was screened from appropriate assessment concluding that the light spill from the flood lights would not cause any significant negative impact to the Slaney River Valley SAC or the Wexford Harbour and Slobs/the Raven SPA due to the directional nature of eh lighting and the small area of light overspill (D'Arcy D. 2018). No significant cumulative impacts were identified as a result of these permitted developments.

The works for the installation of a new pipeline in Wexford Harbour were carried out in 2018. Due to the time lapse between the two projects no in combination effects are anticipated.

Table 6.12 – Summary of planning applications in the vicinity of the River Slaney north of Wexford Bridge to Ferrycarrig and Wexford Harbour

Year	**Location**	**Details**
20200065	Park Wexford	Retention of alterations and extensions to house and entrances as constructed.
20200166	Castlebridge	Permission for construction of 25 No. fully serviced dwelling houses including all associated and ancillary site development development works.
20200539	Ballytramon	Decision pending. Permission for the proposed erection of a fully serviced split level dwelling house with indoor swimming pool together with all associated site works and ancillary services. A NIS was submitted which concluded no significant impact to the Wexford Harbour and Slobs SPA due to the location and the small scale of the development
20200494	Ballytramon	Decision pending. Permission for (a) the proposed demolition of derelict former piggery buildings and stores and a derelict steel shed, (b) the proposed erection of a two-storey office and storage building, (c) the proposed erection of a storage warehouse building (d) for the provision of car parking spaces together with all associated site works and ancillary services F. I. request for AA screening and/or NIS
20200520	Crosstown Ardcavan	Permission for the alterations and extensions to existing dwelling together with all associated site works including boundary treatments and erection of a carport.
20200580	Saunderscourt, Killeen, Kilpatrick	Permission for the proposed erection of a fully serviced dwelling house, domestic shed, carport, on-site treatment system and new vehicular access along with all associated site works to facilitate same.
20190484	Ballytramon Ardcavan	Erection of an extension to side and rear of existing child care centre.
20180320	Park Wexford	Permission for the eretion of two new dressing rooms and a toilet block to the club premises; the conversion of the existing gym area into dressing rooms and the erection of a training shed. Permission for the erection of a covered porch and access
20180589	Commercial Quay	Permission refused on appeal to An Bord Pleanala
20181381	Wexford Tennis Club	Permission for retention to existing building comprising 45 sq m for lift installation.

Table 6.12 – Summary of planning applications in the vicinity of the River Slaney north of Wexford Bridge to Ferrycarrig and Wexford Harbour		
Year	**Location**	**Details**
20181382	Wexford Tennis Club	Permission for erection of 6No. 10 metres flood lights
20171064	Crosstown Ardcavan	Permission for proposed single and 2 storey extension and alterations to existing dwelling at Granard Villa
20170861	Town Park	Permission for construction of two tennis courts and associated site works
20170860	Crosstown	Permission for the retention of single and two storey extensions and alterations to existing dwelling house
20171064	Crosstown	Permission for proposed single and 2-storey extensions, and alterations to existing dwelling
20160981	Park Wexford	Permission for installation of a new sewage treatment system, erection of a boundary wall and alterations to site layout and site boundaries from plans approved under planning reg no. 27301
20161287	Ferrybank North	Permission for (1) the proposed external alterations to main building consisting of (a) the removal of the existing external facade to the west, north and south elevations and for the proposed erection of new cladding, signage and new curtain wall
20151160	Wexford WWTP	Permission for the installation of a new 900mm diameter high-density polyethylene outfall pipeline to be constructed adjacent to the existing outfall pipeline from the shoreline to the existing outfall point in Wexford Harbour. Works were carried out in 2018. No cumulative impacts anticipated due to the time lapse between the two projects
20150352	Park Wexford	Permission for the following at the club grounds, park lane, Wexford: the erection of a toilet block to the club premises and for the conversion of the existing gym area into dressing rooms. Also permission for the erection of a separate covered indoor training area
20150540	Newtown, Carrick	Permission for the erection of a bar and restaurant and all associated site works including car parking facilities, connection to mains sewerage and road junction improvement works to the national primary route n11
20150300	Ferrybank South	Permission to infill a 218 square meter open area at ground floor level of an existing four storey hospital building for use as office space, including new entrance to building, to upgrade, reconfigure and extend the existing car parking to the front of the property from 51 car spaces to 98 car spaces and all associated site works including realigning internal service road at Ely hospital
20141003	Park Wexford	The erection of a 2 storey clubhouse consisting of dressing rooms, gym, assembly/training area, ancillary car parking and site works, connection to existing drains and entrance onto existing new road.
20140241	Crosstown	Retention of the construction of x 2 extension to the side & rear of dwelling house all with ancillary site works
W2014004	Crosstown	Alterations to approved planning permission register number w2012081 consisting of (a) change of house type to the approved new dwelling
20140922	Park Wexford	Demolish an existing rear extension, construct a new rear extension and deck area, construct a separate garage and make alterations to the front elevation of house

Table 6.12 – Summary of planning applications in the vicinity of the River Slaney north of Wexford Bridge to Ferrycarrig and Wexford Harbour		
Year	**Location**	**Details**
20140949	Crosstown	Development will consist of extensions to front, side and rear of existing dwelling, new covered terrace area to the front, amendments to all elevations, internal alterations and all associated site works.
W2013050	Crosstown	Permission for the proposed erection of 2 bedroom granny flat extension to the side of the existing dwelling house together with new wall to roadside boundary and all ancillary services and associated site works on site
W2012081	Crosstown	New dwelling

A review of the Wexford County Development Plan (2013-2019) revealed that the plan seeks to:

- Promote the balanced and sustainable development of the urban and rural areas of the County for a range of residential, services and employment opportunities.
- Protect, conserve and enhance the County's built, natural and cultural environment through promoting awareness, and good quality urban and rural design.
- Promote the balanced and sustainable development of the urban and rural areas of the County for a range of residential, services and employment opportunities.
- Protect and enhance the County's unique natural heritage and biodiversity, while promoting and developing its cultural, educational and eco-tourism potential in a sustainable manner.
- Harness the County's natural resources in a manner that is compatible with the sensitivity of rural areas, the existing quality of life, and the protection and enhancement of the County's natural heritage and biodiversity.

The assessment matrix found in Table 28, Section 7.3 of the SEA report (Vol. 8 Wexford County Council 2013) has assessed each policy and objective and has demonstrated that the plan has overall a sustainable development approach – the plan will ensure the orderly development of the county without adversely affecting the quality of the built and natural environment.

The Appropriate Assessment screening report of the Wexford County Development Plan 2013-2019 found that "the likely impacts that will arise from the draft CDP have been examined in the context of a number of factors that could potentially affect the integrity of the Natura 2000 network. None of the sites within 15 km of the plan area will be adversely affected. It finds that the Plan has been formulated to ensure that uses, developments and effects arising from permissions based upon the Plan (either individually or in combination with other plans or projects) shall not give rise to significant effects on the integrity of any Natura 2000 sites"

In general terms, all proposals for development will be required to have due regard to the environmental considerations outlined in the Draft County Development Plan 2013-2019. Proposals for development which are deemed contrary to the policies and objectives contained within the plan will not normally be permitted.

In addition to this, the Water Framework Directive (WFD) requires that a programme of measures (POMs) is established in order to achieve its environmental objectives. The EU WFD (2000/60/EC), which came into force on 22 December 2000, is the most important piece of European water legislation. It aims to promote common approaches, standards and measures for water management on a systematic and comparable basis throughout the European Union. It establishes a new, integrated approach to the protection, improvement and sustainable use of Europe's rivers, lakes, transitional waters (estuaries), coastal waters and groundwaters. The WFD is implemented in Ireland through River Basin Catchment Management programmes which aim to restore all rivers to good status.

The implementation of the SERBMP Plan will bring incremental improvement leading to the majority of waters reaching at least 'good status' by 2027 at the latest, benefiting the whole community by providing long-term sustainable access to and use of those waters. Where waters are currently at less than good status, they must be improved until they reach good status and there must be no deterioration in the existing status of waters (Wexford County Council 2013b).

In light of the implementation of the WFD and the policies outlined in the County Development Plan and the Wexford Town and Environs Development Plan and the review of recent planning applications, significant 'in combination' effects on with other developments are not anticipated as a result of this development.

6.8 Summary of effects

With reference to the Natura Impact Statement produced for this development that there will be no significant impact on the integrity of the adjacent Slaney River Valley SAC, Wexford Harbour and Slobs SPA and The Raven SPA.

There will be no significant residual negative impacts to any of the habitats or species associated with the development site. Any potential significant impacts have been identified and have influenced the design of the development and informed mitigation measures so that any significant impacts identified have been reduced and any residual effects are minor and are not considered significant.

There is a residual moderate negative impact at the low local scale to the recolonizing bare ground habitat which supports a diverse range of common plant species in the local context. The loss of the recolonising bare ground habitat is not anticipated to have a significant impact on the conservation status of any of the plant species associated with the habitat. The residual impact to the exposed sand and gravel habitat and notable plant species occurring on the site is not anticipated to be significant over the short-term due to the recreation of the habitat. There is a residual moderate negative impact to common lizard and invertebrates and slight negative impact to bat species. These impacts are not anticipated to have a negative impact on the conservation status of these species.

Biodiversity enhancement features have been incorporated into the landscaping design of the development in particular the new freshwater pond will provide a better resource for otters and will also provide a resource for common frogs which currently have limited resources if any on the development site. This will result in a positive effect at the local level.

Landscaping proposed for the development enhances the retained hedgerow habitat. Hibernacula and basking sites for lizard have been incorporated into the landscaping design and gardens associated with the development are predicted in time to provide some biodiversity resources for example for invertebrates, common lizard and garden bird species over time.

The protection of the newly created sand and gravel habitat behind the fence and the vegetation management will ensure the persistence of this habitat and the associated plant species into the future and which in the absence of development is subject to disturbance from trail bike riding and threatened by scrub encroachment. This will have a positive effect at the local level.

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Appendix 6.1 - Consultation responses

Iascach Intíre Éireann
Inland Fisheries Ireland

Deborah D'Arcy
Heather View
Annagh
Gorey
Co. Wexford

22 September 2015

Carcur Park Residential Development, Wexford.

Dear Ms. D'Arcy,

With reference to the above proposed development, we note that the site borders the Slaney Estuary. The Slaney River is an important salmonid system with populations of salmon, brown trout, sea trout, eels, twaite shad, Allis shad and lamprey.
Estuaries and inshore waters provide significant nursery habitat for the larval and juvenile forms of (transitional and marine) fish species, in addition to providing shelter and food for many young and adult fish and shellfish. These in turn provide food resources for other levels of the trophic chain including shore birds, waterfowl, larger fish and marine mammals. Intertidal areas host high densities of benthic fauna in particular worms and molluscs. This in turn can make them important habitats for juvenile fish such as flounder, and juvenile crustaceans such as crabs which may inhabit such habitats in high numbers. The majority of fish in estuaries, feed primarily on the benthos and thus live a demersal existence. Estuarine fish can generally be divided into a number of groups:

- Estuarine dependant (opportunists) species typically enter estuaries from the sea for a period each year but do not stay permanently. The majority of these species drift into estuaries as larvae and when as young fish they become demersal, they take advantage of the rich benthic food sources available in sublittoral and intertidal estuarine habitats. Estuaries contain large numbers of '0 group' fish that use them as nursery grounds before migrating to the sea as recruits to adult populations.
- Marine stragglers enter estuaries irregularly and are often restricted to the seaward end (usually low in numbers of individuals)
- Riverine species come from the freshwater end of the system and are mainly found in low salinity waters.
- Truly estuarine species (residents) comprise only a small number of species although they may form a high overall biomass. The gobies are most typical of this group as they are found in estuaries around the year.
- Migratory species use the estuary and inshore waters as a route from rivers to the open sea or vice versa. Most of these species are anadromous (breed in freshwater) e.g. the

lampreys, the shads and the salmon (*Salmo salar*) / sea trout (Salmo trutta). Eels (*Anguilla anguilla*) are catadromous and breed in the sea.

As you are aware, IFI is charged with the protection, conservation and promotion of fisheries within our functional area. Board policy is aimed at maintaining a sustainable fisheries resource through preserving the productive capacity of fish habitat by avoiding habitat loss, or mitigating harmful alteration to habitat. Projects such as this have the potential to impact on downstream/adjacent fisheries resources if they are not carried out in an environmentally sensitive manner.

We note that your letter states that the site will require infilling as part of the development to raise the level of the area to that required for flood risk management. It is important that access for anglers is maintained over the entire length of the coastal section of this site and that there is an appropriate buffer zone over the coastal section where no infilling is permitted.

The following observations and comments are of necessity of a general nature, as construction proposals and method statements are not as yet available. While they apply to the proposed development in general, the waters in fisheries terms likely to be impacted act primarily as nursery habitat for numerous different species of fish as well as macrophytes, algae and macro-invertebrates. The proposed works, have the potential to convey deleterious matter from those works such as concrete, silt, fuel, lubricating and hydraulic oils from construction plant and equipment to adjacent/downstream waters unless proper safeguards are in place. IFI request you have particular regard to the following in the planning stage of the proposed development.

Uncured concrete can kill fish and macro-invertebrates by altering the pH of the water. When cast-in-place concrete is required, all work must be done in the dry and effectively isolated from any water that may enter the drainage network for a period sufficient to cure the concrete. Concrete delivery vehicles should be precluded from washing out at or in the environs of the site, or at such location as would result in a discharge to surface waters. If bagged cement is stored on site during construction work, it should be held in a dry secure area when not in use.

One of the potential impacts of the proposed development is the discharge of silt-laden waters to waters where earth moving and excavation works are on-going. Silt can clog important fisheries habitat. Similarly, plant and macro-invertebrate communities can literally be blanketed over, and this can lead to loss or degradation of valuable habitat. It is important to incorporate best practices into construction methods and strategies to minimise discharges of silt/suspended solids to waters.

The potential for soil erosion/suspended solids generation is higher, during/after periods of prolonged rainfall. Systems should be put in place to ensure that there shall be no discharge of suspended solids or any other deleterious matter to waters during the construction/operational phase and during any landscaping works. Stockpiles of sand to be used in the works should be covered with sheeting when not in use to prevent washout of fines during rainfall. Stockpiles of topsoil and associated materials arising during site development should be similarly protected. A comprehensive plan should be drawn up at the planning stage with specific measures to address the high potential for silt pollution of adjacent waters during infill/construction and landscaping works.

All oils and fuels should be stored in secure bunded areas, and particular care and attention should be taken during refuelling and maintenance operations on plant and equipment. Bunding should be to a volume not less than the greater of the following; 110% of the capacity of the largest tank or drum within the bunded area, or 25% of the total volume of substance that could be stored within the bunded area. All plant and equipment should carry oil/fuel spill kits. Where temporary diesel or petrol driven pumps are required, they should be sited within portable temporary bunded units. Where site works involve the discharges of drainage water to surface waters, temporary oil interceptor facilities should be installed and maintained. Waste oils, empty oil containers and other hazardous wastes should be disposed of in accordance with the requirements of the Waste Management Act, 1996.

I trust these observations which are without prejudice will be of assistance. Notwithstanding statutory obligations under the planning process requiring the referral of certain applications for planning permission to us, IFI would be obliged to receive advance notification in the event our your clients proposing to submit an application for planning permission.

Yours sincerely,

Donnachadh Byrne
Senior Fisheries Environmental Officer

Please note that any further correspondence regarding this matter should be addressed to Mr. Donnachadh Byrne, Senior Fisheries Environmental Officer, Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

Your Ref:
Our Ref: **G Pre00280/2015**
(Please quote in all related correspondence)

13 April 2016

Deborah D'Arcy
Ecological Consultant
Heather View
Annagh
Gorey
Co. Wexford

Via email to deborahdarcy@eircom.net

Re: Scoping consultation regarding a proposed residential development at Carcur Park, Wexford

A chara

On behalf of the Department of Arts, Heritage and the Gaeltacht, I refer to correspondence received in connection with the above.

Outlined below are heritage-related observations/recommendations of the Department under the stated heading(s).

Nature Conservation

The new compensatory pond must be built prior to the destruction of the existing freshwater pond. Concentrations of otter use were found on the seaward side of this pond and it may be important to otters which frequently require freshwater in which to wash their coats. It should be constructed using current best practice guidance in the construction of such ponds specifically for otter. Detailed design including reference to any guidance documents used must be included in the Planning Application. A regime to monitor usage of the pond to determine success of this mitigation must take place prior to the destruction of the existing pond. Where otter usage is not found, further mitigation may be required to the initial pond design to increase usage by otter prior to the destruction of the existing pond.

There are long-term plans for a bridge across the estuary, served by a road which would run through the development and overlap with the proposed new pond location. Design of the new pond should take into account this and any other potential future development in its vicinity to safeguard its long-term availability to otters. In addition, in combination impacts of this bridge and the development on otter must be covered in the NIS.

The above observations and recommendations are based on the papers submitted to this Department on a pre-planning basis and are made without prejudice to any observations the Minister may make in the context of any consultation arising on foot of any development application referred to the Minister, by a planning authority, in her role as statutory consultee under the Planning and Development Act 2000, as amended.

You are requested to send further communications to this Department's Development Applications Unit (DAU) at **manager.dau@ahg.gov.ie** (team monitored); if this is not possible, correspondence may alternatively be sent to:

The Manager
Development Applications Unit (DAU)
Department of Arts, Heritage and the Gaeltacht
Newtown Road
Wexford
Y35 AP90

Is mise, le meas

Yvonne Nolan

Yvonne Nolan,
Development Applications Unit

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

Your Ref:
Our Ref: **G Pre00280/2015**
(Please quote in all related correspondence)

21 October 2015

Deborah D'Arcy
Ecological Consultant
Heather View
Annagh
Gorey
Co. Wexford

Via email to deborahdarcy@eircom.net

Re: Scoping consultation regarding a proposed residential development at Carcur Park, Wexford

A chara

On behalf of the Department of Arts, Heritage and the Gaeltacht, I refer to correspondence received in connection with the above.

Outlined below are heritage-related observations/recommendations of the Department under the stated heading(s).

<u>Nature Conservation</u>
You have indicated that this proposed residential development is adjacent to the Slaney River Valley candidate Special Area of Conservation (cSAC) and the Wexford Harbour and Slobs Special Protection Area (SPA). You have indicated that your assessment will include bi-monthly low tide counts. It is not clear why high tide counts are not included as birds may roost on the proposed development site depending on the habitat type present. It is not clear from the documentation provided what the current habitat is on this site. It is envisaged by this Department that the impacts on the SPA will include disturbance both at construction stage and from the use of the proposed linear park as well as possible loss or changes in habitat of the development site which may have been used by birds from the SPA. These issues should be assessed.

It is envisaged by this Department that the impacts on the cSAC will include potential loss of habitat and there is a risk that imported fill may contain invasive species. In addition if the raising of the land for flood management could change patterns of erosion and deposition then there could be hydrogeomorphological impacts elsewhere. These issues need to be assessed.

Apart from the above there may also be some loss of biodiversity resulting from the changed use of the site and this should be mitigated for. In particular it is important that the coastal fringe of maritime vegetation should be retained and that any future coastal paths would be landward of such vegetation. Design criteria should consider how to reduce foreshore dumping of garden waste, for example ensuring that garden boundaries are not adjacent to the foreshore.

It has been noted by this Department that some vegetation clearance of the site has already taken place. Such clearance could prejudice the vegetation and species survey for the EcIS and no further clearance should take place.

Please find below some generic scoping comments for EcIS and appropriate assessment screening/appropriate assessment and for licensing requirements which may assist you in scoping your assessment.

EcIS

Ecological Survey

With regard to scoping for an EcIS for a proposed development, in order to assess impacts on biodiversity, fauna, flora and habitats, an ecological survey should be carried out of the site of the proposed development site including the route of any access roads, pipelines or cables etc. to survey the habitats and species present. Where ex-situ impacts are possible survey work may be required outside of the development sites. Such surveys should be carried out by suitably qualified persons at an appropriate time of the year depending on the species being surveyed for. The EcIS should include the results of the surveys, and detail the survey methodology and timing of such surveys. It is expected by this Department that in any survey methodology used that best practice will be adhered to. The EcIS should cover the whole project, including construction, operation and, if applicable, restoration or decommissioning phases. Alternatives examined should also be included in the EcIS. Inland Fisheries Ireland should be consulted with regard to fish species if applicable. For information on Geological and Geomorphological sites the Geological Survey of Ireland should be consulted.

Baseline data

With regard to the scope of baseline data, details of designated sites can be found at www.npws.ie . For flora and fauna the data of the National Parks and Wildlife Service (NPWS) should be consulted at www.npws.ie . Where further detail is required on any information on the website www.npws.ie , a data request form should be submitted. This can be found at http://www.npws.ie/maps-and-data/request-data . Other sources of information relating to habitats and species include that of the National Biodiversity Data Centre (www.biodiversityireland.ie), Inland Fisheries Ireland (www.fisheriesireland.ie), BirdWatch Ireland (www.birdwatchireland.ie) and Bat Conservation Ireland (www.batconservationireland.org). Data may also exist at a County level within the Planning Authority.

Impact assessment

The impact of the development on the flora, fauna and habitats present should be assessed. In particular the impact of the proposed development should be assessed, where applicable, with regard to:

- Natura 2000 sites, i.e. Special Areas of Conservation (SAC) designated under the EC Habitats Directive (Council Directive 92/43/EEC) and Special Protection Areas designated under the EC Birds Directive (Directive 2009/147 EC),
- Other designated sites, or sites proposed for designation, such as Natural Heritage Areas and proposed Natural Heritage Areas, Nature Reserves and Refuges for Fauna or Flora, designated under the Wildlife Acts 1976 to 2010,
- Species protected under the Wildlife Acts including protected flora,
- '*Protected species and natural habitats*', as defined in the Environmental Liability Directive (2004/35/EC) and European Communities (Environmental Liability) Regulations, 2008, including Birds Directive – Annex I species and other regularly occurring migratory species, and their habitats (wherever they occur) and Habitats Directive – Annex I habitats, Annex II species and their habitats, and Annex IV species and their breeding sites and resting places (wherever they occur),
- Important bird areas such as those identified by Birdlife International,
- Features of the landscape which are of major importance for wild flora and fauna, such as those with a "stepping stone" and ecological corridors function, as referenced in Article 10 of the Habitats Directive.
- Other habitats of ecological value in a national to local context (such as those identified as locally important biodiversity areas within Local Biodiversity Action Plans and County Development Plans).
- Red data book species,
- and biodiversity in general.

Reference should be made to the National Biodiversity Plan and any relevant County Biodiversity Plan. Any losses of biodiverse habitat associated with this proposed development, such as woodland, scrub, hedgerows and other habitats should be mitigated for.

In order to assess the above impacts it may be necessary to obtain hydrological and/or geological data. In particular any impact on water table levels or groundwater flows may impact on wetland sites some distance away. The EcIS should assess cumulative impacts with other plans or projects if applicable. Where negative impacts are identified suitable mitigation measures should be detailed if appropriate. As EU Member States have to report every 6 years on the National resource of habitats and species listed under the Habitats Directive it is important that any impact on such habitats and species both inside and outside of Natura 2000 sites is recorded.

Alien invasive species

The EcIS should also address the issue of invasive alien plant and animal species, such as Japanese Knotweed, and detail the methods required to ensure they are not accidentally introduced or spread during construction. Information on alien invasive species in Ireland can be found at http://invasives.biodiversityireland.ie/ and at http://invasivespeciesireland.com/ .

Hedgerows, and protected species

Hedgerows form important wildlife corridors and provide areas for birds to nest in. In addition badger setts may be present. If suitable trees are present bats may roost there and they use hedgerows as flight routes. Hedgerows also provide a habitat for woodland flora. Where a hedgerow forms a townland or other historical boundary it is usually an old hedgerow. Such hedgerows will contain more biodiversity than a younger hedgerow. Hedgerows should be maintained where possible. The EcIS should provide an estimate of the length of hedgerow that will be lost, if any. Where trees or hedgerows have to be removed there should be suitable planting of native species in mitigation. Where possible hedgerows and trees should not be removed during the nesting season (i.e. March 1st to August 31st). Birds nests can only be intentionally destroyed under licence issued under the Wildlife Acts of 1976 and 2000.

Bats

Bat roosts may be present in trees, buildings and bridges. Bat roosts can only be destroyed under licence under the Wildlife Acts and a derogation under the Habitats Regulations and such a licence would only be given if suitable mitigation measures were implemented. Where so called bat friendly lighting is proposed as mitigation then it should be proven to work as mitigation.

Rivers and Wetlands

Wetlands are important areas for biodiversity. Any watercourse or wetland impacted on should be surveyed for the presence of protected species and species listed on Annexes II and IV of the Habitats Directive. These species could include otters (*Lutra lutra*), which are protected under the Wildlife Acts and listed on Annexes II and IV of the Habitats Directive, Salmon (*Salmo salar*) and Lamprey species listed on Annex II of the Habitats Directive, Freshwater Pearl Mussels (*Margaritifera species*) and White-clawed Crayfish (*Austropotamobius pallipes*) which are protected under the Wildlife Acts and listed on Annex II of the Habitats Directive, Frogs (*Rana temporaria*) and Newts (*Trituris vulgaris*) protected under the Wildlife Acts and Kingfishers (*Alcedo atthis*) protected under the Wildlife Acts and listed on Annex I of the Birds Directive (Council Directive 79/409 EEC).

A suitable riparian habitat should be left along each watercourse. Construction work should not be allowed impact on water quality and measures should be detailed in the EcIS to prevent sediment and/or fuel runoff from getting into watercourses which could adversely impact on aquatic species. Flood plains, if present, should be identified in the EcIS and left undeveloped to allow for the protection of these valuable habitats and provide areas for flood water retention. If applicable the EcIS should take account of the guidelines for Planning Authorities entitled "*The Planning System and Flood Risk Management*" and published by the Department of the Environment, Heritage and Local Government in November 2009.

IFI should be consulted with regard to impacts on fish species and the applicant may find it useful to consult their publication entitled "Planning for watercourses in the urban environment" which can be downloaded from their web site at http://www.fisheriesireland.ie/fisheries-management-1/86-planning-for-watercourses-in-the-urban-environment-1 .

Water quality

Ground and surface waters quality should be protected during construction and operation of the proposed development and if applicable the applicant should ensure that adequate sewage treatment facilities are or will be in place prior to any development. The applicant should also ensure that adequate water supplies are present prior to development.

Marine

Marine information is available at http://www.npws.ie/marine/

Green Infrastructure

From a biodiversity point of view it is important to take note of the EU Green Infrastructure Strategy. Further information on this can be found at http://ec.europa.eu/environment/nature/ecosystems/docs/green_infrastructure_broc.pdf . Care should be taken to ensure that green infrastructure involves greening existing infrastructure rather than adding infrastructure to existing biodiversity corridors or other areas rich in biodiversity. With regard to waterways, the applicant may find it useful to consult the IFI publication entitled “Planning for watercourses in the urban environment” which can be downloaded from their web site at http://www.fisheriesireland.ie/fisheries-management-1/86-planning-for-watercourses-in-the-urban-environment-1 .

CMPs

Complete project details including construction management plans (CMPs) need to be provided in order to allow an adequate assessment to be undertaken. Applicants need to be able to demonstrate that CMPs and other such plans are adequate and effective mitigation, supported by scientific information and analysis, and that they are feasible within the physical constraints of the site. The positions, locations and sizes of construction infrastructure and mitigation, such as settlement ponds, disposal sites and construction compounds, may significantly affect European sites, other designated sites, habitats, and species in their own right and could have an effect for example on drainage, water quality, habitat loss, and disturbance. If these are undetermined at time of the assessment, all potential effects of the development on the site are not being considered. If applicants are not in a position to decide the exact location and details of these at time of application, then they need to consider the range of options that may be used in their assessment so that all issues are covered.

Appropriate Assessment

Guidance

With regard to appropriate assessment (AA) and screening for AA, some Guidance documents are referred to below which may help. However CJEU case law has to some extent clarified certain issues and should be consulted. In particular case C-258/2011-N6 Galway City Outer Bypass is relevant as is the recent opinion on the Briels case, C-521/12.

Guidance on AA is available in the Departmental guidance document on Appropriate Assessment, which is available on the NPWS web site at http://www.npws.ie/sites/default/files/publications/pdf/NPWS_2009_AA_Guidance.pdf and in the EU Commission guidance entitled "*Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*" which can be downloaded from http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pdf

Conservation objectives

In order to carry out the appropriate assessment screening, and/or prepare the Natura Impact Statement (NIS), information about the relevant Natura 2000 sites including their conservation objectives will need to be collected. Details of designated sites and species and conservation objectives can be found on www.npws.ie . Site-specific, as opposed to generic, conservation objectives are now available for some sites. Each conservation objective for a qualifying interest is defined by a list of attributes and targets and are often supported by further documentation. Where these are not available for a site, an examination of the attributes that are used to define site-specific conservation objectives for the same QIs in other sites can be usefully used to ensure the full ecological implications of a proposal for a site's conservation objective and its integrity are analysed and assessed. It is advised, as per the notes and guidelines in the site-specific conservation objectives, that any reports quoting conservation objectives should give the version number and date, so that it can be ensured and established that the most up-to-date versions are used in the preparation of Natura Impact Statements and in undertaking appropriate assessments.

Where further detail is required on any information on the website www.npws.ie , a data request form should be submitted. This can be found at http://www.npws.ie/maps-and-data/request-data .

Cumulative and ex situ impacts

A rule of thumb often used is to include all Natura 2000 sites within a distance of 15km. It should be noted however that this will not always be appropriate. In some instances where there are hydrological connections a whole river catchment or a groundwater aquifer may need to be included. Similarly where bird flight paths are involved the impact may be on an SPA more than 15 km away.

Other relevant Local Authorities should be consulted to determine if there are any projects or plans which, in combination with this proposed development, could impact on any Natura 2000 sites

Water and wastewater

If this development is not on mains sewerage then impacts from wastewater, including cumulative impacts, on groundwater and any nearby surface waters or wetland habitats should be assessed. In addition if it is not on mains water supply then impacts, including cumulative impacts, relating to water abstraction should be assessed. This may require hydrogeological information. Where connection will be to existing infrastructure the impact of the demand for additional potable water, waste water treatment, and additional surface runoff should be assessed.

Alien invasive species

If the proposed development is adjacent to a Natura 2000 site and involves landscaping or a garden, care should be taken to ensure that no terrestrial or aquatic invasive species are used which could impact negatively on these sites. Information on alien invasive species in Ireland can be found at http://invasives.biodiversityireland.ie/ and at http://invasivespeciesireland.com/ .

CMPs

Complete project details including construction management plans (CMPs) need to be provided in order to allow an adequate appropriate assessment to be undertaken. Applicants need to be able to demonstrate that CMPs and other such plans are adequate and effective mitigation, supported by scientific information and analysis, and that they are feasible within the physical constraints of the site. The positions, locations and sizes of construction infrastructure and mitigation, such as settlement ponds, disposal sites and construction compounds, may significantly affect European sites, designated sites, habitats, and species in their own right and could have an effect for example on drainage, water quality, habitat loss, and disturbance. If these are undetermined at time of the assessment, all potential effects of the development on the site are not being considered. If applicants are not in a position to decide the exact location and details of these at time of application, then they need to consider the range of options that may be used in their assessment so that all issues are covered. The CMP should also include methods to ensure invasive alien species are not introduced or spread.

Licences

Where there are impacts on protected species and their habitats, resting or breeding places, licences may be required under the Wildlife Acts or derogations under the Habitats Regulations. In particular bats and otters are strictly protected under annex IV of the Habitats Directive and a copy of Circular Letter NPWS 2/07 entitled "*Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 – strict protection of certain species/applications for derogation licences*" can be found on the Departmental web site at http://www.npws.ie/sites/default/files/general/circular-npws-02-07.pdf

In addition licences will be required if there are any impacts on other protected species or their resting or breeding places, such as on protected plants, badger setts or birds nests. Where possible hedges and trees should not be removed during the nesting season (i.e. March 1st to August 31st). Birds nests can only be intentionally destroyed under licence issued under the Wildlife Acts of 1976 and 2000.

In order to apply for any such licences or derogations as mentioned above the results of a survey should be submitted to the National Parks and Wildlife Service of this Department. Such surveys are to be carried out by appropriately qualified person/s at an appropriate time of the year. Details of survey methodology should also be provided. Such licences should be applied for in advance of planning to avoid delays and in case project modifications are necessary.

Should this survey work take place well before construction commences, it is recommended that an ecological survey of the development site should take place immediately prior to construction to ensure no significant change in the baseline ecological survey has occurred. If there has been any significant change mitigation may require amendment and where a licence has expired, there will be a need for new licence applications for protected species.

The above observations and recommendations are based on the papers submitted to this Department on a pre-planning basis and are made without prejudice to any observations the Minister may make in the context of any consultation arising on foot of any development application referred to the Minister, by a planning authority, in her role as statutory consultee under the Planning and Development Act 2000, as amended.

You are requested to send further communications to this Department's Development Applications Unit (DAU) at **manager.dau@ahg.gov.ie** (team monitored); if this is not possible, correspondence may alternatively be sent to:

The Manager
Development Applications Unit (DAU)
Department of Arts, Heritage and the Gaeltacht
Newtown Road
Wexford
Y35 AP90

Is mise, le meas

Yvonne Nolan

Yvonne Nolan,
Development Applications Unit
Tel: (053) 911 7382

Appendix 6.2

Otter *Lutra lutra* survey of the Lower River Slaney Estuary at Carcur, Co. Wexford

October 2016

PROJECT TITLE	**Carcur Residential Housing Project**
REPORT TITLE	**Otter *Lutra lutra* survey of the Lower River Slaney Estuary at Carcur, Co. Wexford**
AUTHORS	**Ross Macklin (Tirturus Environmental Services)**
DOCUMENT NO. & REVISION	**JN01_16_3 (For Issue)**
Date	**10th October 2016**

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1. Introduction

Triturus Environmental Services were contracted by Seamus Neville & Sons to undertake a European Otter *Lutra lutra* (L.) survey (hereafter otter) on the River Slaney estuary at Carcur, Co. Wexford between January and March 2016. The surveys would identify the distribution pattern of otters in the light of a proposed residential housing development in the area (see Figure 2.1 below).

The River Slaney Estuary is known as an important habitat for otter and the species is found from the upper reaches of the river system as far downstream as Wexford Harbour. The presence or absence of otters in the vicinity of the proposed development will help inform mitigation to prevent impacts to the local population as a result of proposals. The species is considered vulnerable given their reliance on fish food supplies, sensitivity to disturbance and pollution in addition to their short life cycle and small litter sizes (Channin, 2003).

Of most importance in terms of conservation are natal holting sites where otters rear their young. To date there has been limited research on otters inhabiting the Lower River Slaney and Wexford Harbour apart from work carried out during the national otter surveys. Therefore, by identifying contemporary records of otter utilisation of the River Slaney estuary at Carcur, any overlap between otter breeding and feeding places and the proposals can be established.

Triturus Environmental Services made an application under Sections 9 & 23 (6) b of the Wildlife Acts 1976 to 2012 to monitor otter holt activity by means of trail camera surveillance at Carcur. A license was required given that the use of camera equipment near a breeding/ resting site. As such this act may constitute a disturbance. Subsequently Triturus were successfully granted a license to undertake surveys between January and March 2016. The Development Applications Unit planning reference for the project is GPRE00280/2015 (proposed residential development at Carcur Park, Wexford).

Otter Legal Status in Ireland

Otter are listed under Annex II & V of the EU Habitats Directive (92/43/EEC). Otter breeding and resting areas are afforded protection under the Wildlife Act 1976 and Wildlife (Amendment) Act, 2000 (S.I. No. 38 of 2000) and the European Communities (Birds and Natural Habitats) Regulations, 2011. More specifically with regard to development it is considered an offence to;

- Deliberately or Intentionally kill, injure or capture an otter
- Deliberately disturb an otter

- Possess or control any live or dead specimen or anything derived from an otter
- Wilfully interfere with any structure or place used for breeding or resting by an otter
- Damage or destroy a breeding site or resting place of an otter

Otter Conervation Status in Ireland

Otter conservation status has been assessed as 'Near threatened' (Marnell et al. 2009). The previous Article 17 report on the Status of EU Protected Species and Habitats in Ireland for otter, deemed the prospects of the population trend to be poor (NPWS, 2008). This was accounted for by an estimated 24% decline in the estimated number of breeding females from 8,400 to 6,400 (Marnell et al. 2011). However, the range of the species (66500km^2) still remained favourable (NPWS, 2008), in addition to the habitat and future prospects (NPWS, 2008). During follow up surveys (i.e. the 2010/2012 National Otter Survey of Ireland) it was illustrated that there was an increase in otter range by order of 31% from the 1993-2006 survey data. Despite an increase in the range of the species the established population baseline estimates from 1993-2006 were not significantly different (Reid et al. 2013). The data collated under the statutory parameters in assessing the conservation status of a species i.e. range, population, habitat & future prospects were considered to be in 'Favourable or Good Conservation Status' in contradiction to the findings of earlier national otter surveys. The observed positive trends (i.e. changes from previous survey conclusions) were linked to more accurate data collation and survey knowledge rather than empirical evidence of improved conservation status (Reid et al. 2013).

Otters are listed as a conservation objective species in the Slaney River Valley SAC (site code 0781; NPWS 2011). Despite being a conservation objective species limited research on the distribution of otter within the River Slaney Estuary has been undertaken apart from the National Otter Surveys undertaken during 1980/1981, 2004/2005, 2010/2011. It is apparent that there has been some trend of decline in the number of positive otter records recorded at sites of the River Slaney, despite inconsistency in the sample size between years (see Table 1.1 below; Reid et al. 2013).

Table 1.1 – Number of Positive Otter records at survey sites on the River Slaney during the National Otter Surveys between 1980/1981, 2004/2005 & 2010/2011 (extracted from Reid et al. 2013).

Year	1980/1981		2004/2005		2010/2011	
Criteria	**+ve/n**	**%**	**+ve/n**	**%**	**+ve/n**	**%**
Records	55/57	96.5	15/17	88.2	3/7	42.9

2. Methods

Study Site

The townland of Carcur, Co. Wexford in which the study site is situated, is located 2km north west of Wexford Bridge (Irish Grid, T 03795 23321). The site is located on the southern banks of the Lower River Slaney Estuary (IE_SE_040_0200) which itself is contained within Hydrometric Area 12 and within the South Eastern River Basin District. The transitional waters of the Lower River Slaney Estuary are considered potentially eutrophic according to the Environmental Portection Agency (i.e. downstream of Oilgate[1]). The Upper River Slaney Estuary however, has improved water quality, being of 'Intermediate Quality' or essentially achieving moderate levels of enrichment. The study site is also located within the Slaney River Valley SAC (site code 0781), the Wexford Slobs and Harbour SPA (site code 4076) and the Wexford Slobs & Harbour pNHA (site code 0712).

The River Slaney catchment contains approx. 4.94km^2 of fluvial habitat, with the entire accessible reaches of the catchment comprising 4.38% of the total national riverine habitat accessible to Atlantic salmon, ranking it 7th nationally (McGinnity et al., 2003). The wider river basin thus contains fisheries resources important for the sustenance of otter populations that predate on salmonids.

The Carcur area was traditionally an Atlantic salmon *Salmo salar* draft net fishery. Inshore sheltered estuarine areas with bays act as excellent holding areas for salmon and seatrout *Salmo trutta* in advance of migration upriver. The rich feeding resourves of the Slaney River and Estuary thus provide a good foraging area for otter.

Otter Activity Survey

Walkover otter surveys were conducted during dry weather conditions between January and March 2016. The surveys helped identify patterns of otter usage of the site (i.e. by evidence of spraint, latrines, couches, prints, slides etc). Walkover surveys targeted gravel / sand bars adjoining the estuary, grassy points, scrub, ponds and drainage channels where spraint, slides and prints can be typically found found. Embankments and areas of dense vegetation were examined for evidence of holting. The walkover surveys followed the best practice survey methodology as recommended by Chanin (2003) and Bailey & Rochford (2006);

- Sites are selected at convenient access points;
- A survey is carried out for spraints (but other signs, such as prints, fish remains, slides, etc. are also recorded) over a distance of 600m along the bank;

[1] Refer to EPA envision webmapper at www.epa.ie

- At Carcur however, the full extent of the site was surveyed along the coast and along any freshwater habitats, areas of scrub and areas of known otter activity;
- At each discrete block of otter habitat sketch maps were drawn and photographs taken to aid relocation, while habitat variables (both aquatic and terrestrial) including pollution and disturbance levels were recorded.
- Holt sites were mapped relative to the extent adjoining areas of cover (i.e. scrub/ woodland/ treelines etc.) to define the breadth of the habitat to establish the current extent of otter habitat cover.

It is widely known that otter mark territory by sprainting. Aggregations of spraint indicate regular use of a particular area by otter and can be used as a proxy for otter usage of a particular area of habitat. At Carcur otter activity was monitored over three periods between Janaury and February 2016 to establish patterns of otter usage of the site. The numbers of otter spraints were counted at each sprainting site and the location of each sprainting site was recorded in ITM co-ordinates using a garmin Oregon GPS unit. The data was then transferred into a GIS database using Qunatum 2.10. Heat maps of spraint density were then constructed for each survey time period (i.e. 3 no.) to identify otter usage of the wider site. By comparing otter usage of the site temporally it was possible to establish 'hotspots' of otter activity and this would help tailor the mitigation proposals to prevent impacts to the species.

Camera Surveys at Holts

Given the evident high usage of the intertidal habitat by otter and the presence of potential otter breeding sites it was deemed necessary to undertake follow up holt surveys to the preliminary walkover surveys carried out during the autumn and winter of 2015. Further surveys were then commissioned for the winter and early spring of 2016.

Following the identification of patterns of otter usage of the site including validation of potential natal holt sites (as identified during preliminary site surveys), four cameras were positioned at strategic locations including access points to holt areas. Given that the cameras have a trigger range of 20m they were placed no closer than 10m from holt entrances where possible to minimise disturbance. Cameras were positioned during the day to avoid potential disturbance to otters that are most active at dawn, dusk or nocturnally. The cameras record time, date, temperature and other attributes and are triggered by mammal movement using infra red sensors. Cameras were repositioned after

Example of an otter detected using a Browning trail camera on the River Lee, Co. Cork

10 day static periods at six time intervals between January and March 2016. Browning special ops XTR 10MP, infrared cameras were used as they are considered the best available on the market and have silent black flash that causes a minimal disturbance to wildlife. In advance of commencement of the survey the local ranger of the NPWS was notified.

The trail cameras were alternated between potential holt sites that were identified on the first site walkover conducted in early January 2016. Cameras were positioned along identified animal trails leading into the observed excavated entrances to dwellings. The number of camera triggers would indicate the frequency of use. It was not possible in all cases to get very clear shots given the security of the cameras along a relatively open shoreline that is walked by patrons of Wexford Town.

Constraints (Camera Trapping)

For security reasons and because of the tidal range on the foreshore, the position of trail cameras was somewhat restricted. As such camera angles and had to be enclosed at tight angles and utilise the existing tree and embankment as best as possible in order to void theft. Furthermore, very wet weather conditions often resulted in lens condensation.

Habitat Mapping

Habitat mapping was prepared by Deborah D'Arcy (lead ecologist on the project) as part of other ecological reporting being prepared as part of the Ecological Impact Assessment. The habitat mapping helped establish the nature of the baseline terrestrial landscape in order to define the extent of available otter habitat relative to the location of holt sites, feeding territory and bathing areas. Typical habitat of importance to otter includes treelines, scrub, flowing water, ponds and any habitat that can support food or secluded breeding (e.g. wetlands with amphibians, culverts with rodents, estuaries with fish and crustaceans etc.). The situation of identified habitats whether breeding or foraging areas relative to concentrations of activity can then be identified in terms of their functional importance as habitats supporting otter.

Optimum Survey Period and seasonal sensitivities

There is not specifically an optimal season for otter surveying as the species is active all year round and can breed at any time during the year. By covering three months of surveying between January and March 2016, the chances of detecting otter usage of a holt site was better optimised.

Figure 2.1 - Carcur Otter Survey Area, Carcur, Co. Wexford (prepared on google street map base layer)

3. Results

Habitats at Carcur

The site area at Carcur, Co. Wexford (Irish Grid, T 03795 23321) was defined as a loosely triangular block of land dominated by scrub and broken treelines. Much of the scrub from the centre of the site had been cleared meaning the majority of the site comprised recolonising bare ground spoil heaps with clumps of cut gorse. The eastern boundary of the site was marked by a narrow strip of broadleaved woodland and the south by amenity grassland GAA fields. The south east of the site contained a block of reed swamp bordering the Wexford railway line. Estuarine habitat marked the northern and eastern boundaries of the site. Where boundaries of the site overlapped intertidal hbitat they were divided by linear strips of gorse scrub and scattered trees. These habitats provided a degree of seclusion for otter moving along the intertidal area. A small pond was located to the north east of the site which provided an area for otters to bath.

Otter Usage of Site

During the autumn and winter of 2015 otter records were collected by Tom Gittings and Deborah D'Arcy at Carcur (December 2015 records illustrated above in Figure 3.1 below). Further repeat surveys were undertaken by Ross Macklin during January through March 2016. The follow up surveys were commissioned to consolidate further information on the patterns of usage on the site by otter. Otter activity in the form of spraints, couches and potential holting areas was concentrated along the intertidal (see Figures 3.1, 3.2 & 3.3). Records were found almost exclusively within 15m of the high tide mark. Concentrations of spraint were located predominantly in narrow strips of dry grassland adjoining the intertidal and scrub areas. While occasional spraint and prints were found on the sand and shingle of the intertidal, these areas are inundated on high tide and such were washed away quickly unless fresh at the time of surveying. Overall the most regular sprainting sites were concentrated at three areas. These were to the west of the site at an open grassy emebankment adjoining broadleaved woodland, between the pond and point to the north east of the site and between the small track and reedswamp to the south east of the site. The sprainting area to the south east of the site was used with less regularity during the winter and early spring of 2016 than during the autumn and winter of 2015. What remains clear is that areas of dry grassy embankment adjoining the intertidal were the most important sprainting areas (see Figure 3.1 & 3.2).

Figure 3.1 – Otter records December 2015, Carcur, Co. Wexford using a geo-rectified Bing Aerial Image

Visual Sightings of Otter

Otter are considered a shy animal in most istances and are considered to be most active at dawn, dusk and during the night. However, occasionally they can be seen during the day, should feeding, social behaviour or other stimuli permit daytime activity. Visual observations of otter were recorded by Tom Gittings while carrying out eight winter bird survey counts between September 2015 and January 2016. Each survey took between 5-6 hours at low tide between Wexford Bridge and Ferrycarrig Bridge and / or ebb/ flood tide counts around the development site at Carcur. Live sightings were recorded on two occasions;

- 29/10/2015 - 1 seen swimming into shore and then going into reeds, carrying a fish, near Castlebridge end of estuary (approx grid ref 304300 125200) at 12:50.
- 10/12/2015 - 2 on eastern shore of site, just up from reedbed, in intertidal zone, close to path into scrub (approx grid ref 303700 122900) at 08:35. Observed from northern shore through telescope. Both animals appeared to be grooming, possible mutual. One in front was an adult, the other was patially obscured.

Figure 3.2 – Location of otter records (spraint, prints, slides excluding holts & couches) at Carcur, Co. Wexford

Holt Surveys (using camera surveillance)

Potentential holts were identified as excavations with gaps >30cm in dimater, with evidence of usage in the form of worn tracks through scrub and grassy areas, otter hair on bramble, fish remains etc. Such features coupled with knowledge of otter scent (a useful cue for otter presence) helped identify suspected holt areas. Furtheemore, large openings underneath tree rooting zones and man made structures that provided oppurtunities were also investigated (see Figure 3.3 below).

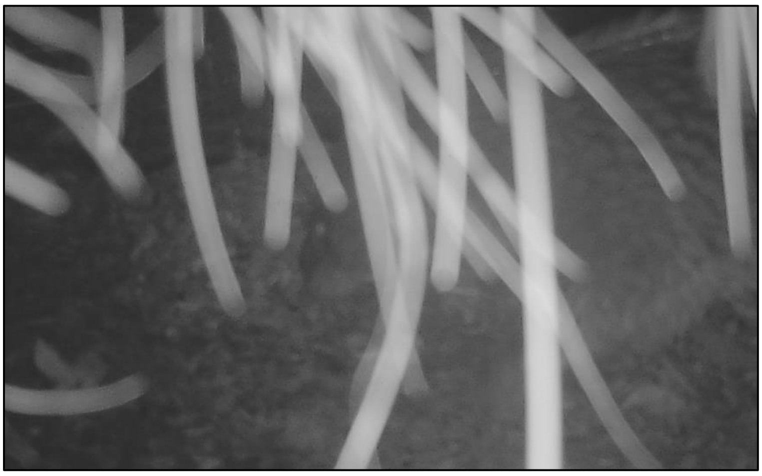
Sites with good potential were typically surrounded by scrub (dominated by gorse) and or trees including oak and hawthorn. The root zones allowed animals to excavate under the soil structure bound by the root zones. Often there were sequences of smaller burrows and these were a readily indentifiable example of rat dwellings rather than otter.

Example of excavation (monitored as a potential holt west of pond)

Fox entering potential den area near gorse scrub at pond

Brown rat near potential holt western end of site

While some of the potential holt site excavations were large >40cm in height and upto 80cm wide (maximum) they were used by brown rats at the time of the survey as the cameras revealed very frequent nocturnal triggers by rats and / or mice. Rats and mice are very common in Wexford given the known grain production in the wider region. Fox were common near areas containing gorse scrub, where they likely were hunting rats and mice. Otter activity near the observed potential holt excavations was limited. Indeed the only potential holt site where otter were recorded with any frequency was a holt structure situated in a boulder pile forming part of the treeline/ embankment bordering the shoreline to the north of the site. This man made holt was specifically located near an overgrown trail into gorse scrub leading to the holt.This area was considered to be used as an infrequent resting place as <10 triggers were noted here over a 45 day monitoring period. Nonetheless this was the only potential holt site where some level of otter activity was detected. While frequent use of a holt site was not detected as described above, frequent activity at other otter resting places in the open was identified. These resting areas know as 'couches' were located at three distinct areas in dry grassy verges between the interidal zone and land boundaries. They were as follows and as illustrated on Figure 3.3; i) *To the west of the site (near broadleaved forestry strip)*, ii) *between the pond and the point to the north east of the site*, and iii) *near the junction of a small path and the shoreline to the east of the site*. These flattened areas of grassy banks were often accompanied by piles of otter spraint



Otter entering man made holt site

Otter movement approaching man made holt nearby and were above the high tide limit. Given they were accompanied by scrapings and high numbers of spraints (i.e. often >5) they could be considered as 'latrine sites'.

Table 3.1 – Holt Survey Records from trail camera surveillance

Potential Holt Description	Location (ITM)	Number of Camera Triggers	Animal Detected (number of triggers in parenthesis)
1. Excavation on embankment bordering intertidal	703664, 623365	4	Fox
2. Excavation on embankment bordering intertidal	703561, 623402	>100	Rat, Mouse
3. Excavation on embankment bordering intertidal	703344, 623844	>75	Rat, Mouse
4. Excavation on embankment bordering intertidal	703346, 623486	>50	Fox
5. Man made (old boulder pile in gorse scrub)	703459, 623447	10	Otter (9), Grey crow (1)
6. Excavation on embankment bordering intertidal	703242, 623499	20	Fox

Excavation on embankment bordering intertidal	703081, 623497	>50	Rat, Thrush

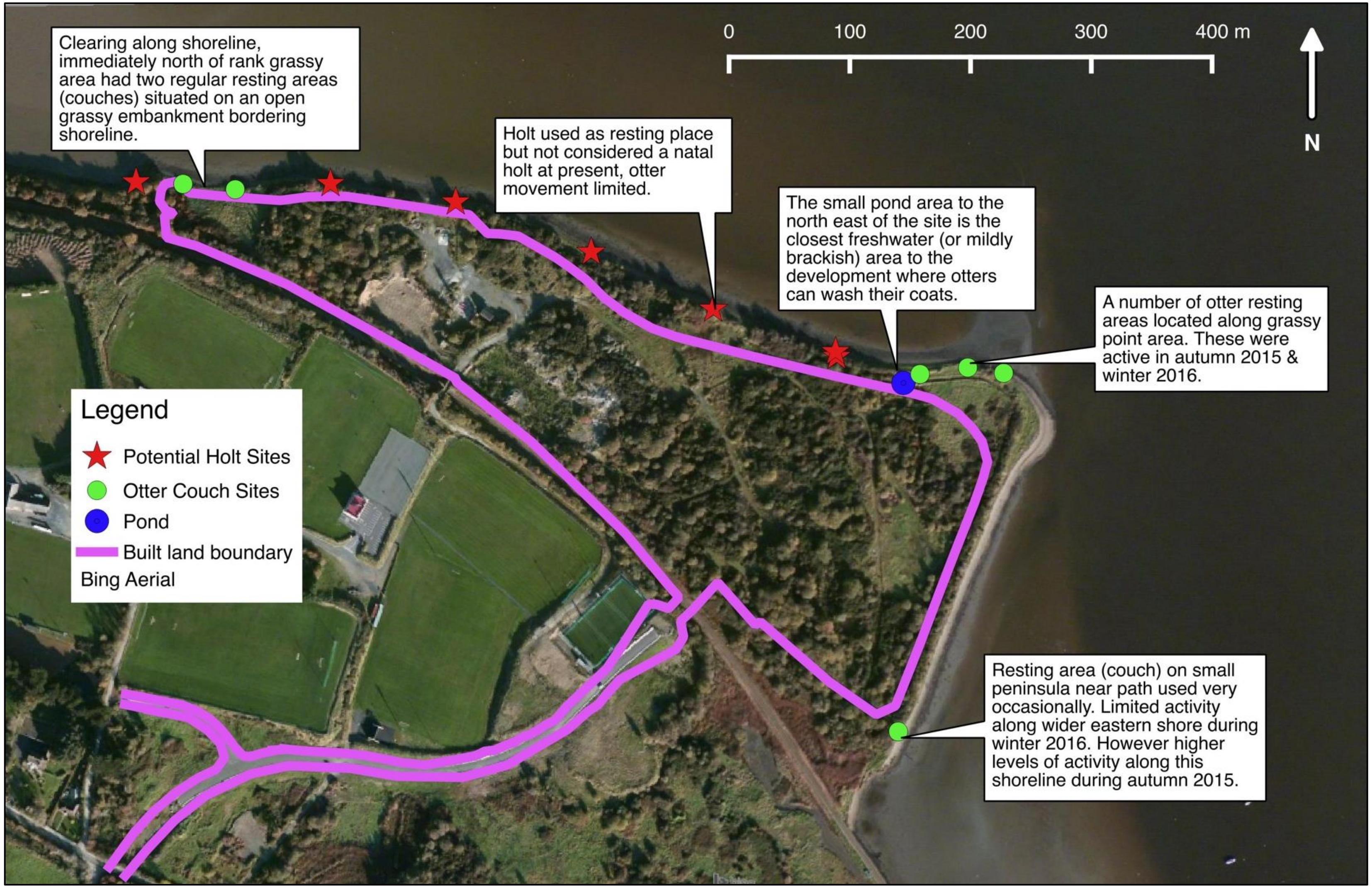


Figure 3.3 – Location of potential holt sites & identified resting areas (couches) at Carcur, Co. Wexford

4. Discussion

Otter Usage of the Study Area

Information on otter activity in the footprint of the proposed development site at Carcur, Co. Wexford was collated by recording patterns of otter activity during the autumn and late winter of 2015 and during the winter and early spring of 2016. The otter usage of the study area at Carcur was exclusively restricted to areas within 15m of the intertidal. Sprainting sites were detected in dry grassy strips adjoining the intertidal. Otter also frequently visited a small ponding area to the north east of the site (see Figure 3.2 above). This was likely a functional visit as otters are known to wash their coats upto once a day in freshwater. Given that the patterns of use were relatively consistant overtime at Carcur, it has been identified that the four important zones of otter activity exist adjacent to the proposed development. They include the following areas;

1. The open grassy embankment adjoining the woodland strip and small point to the north west of the site
2. The small freshwater pond to the north east of the site
3. The large point and adjoining dry grassy areas to the north east of the site (majority of records detected here)
4. The south eastern extent of the site (near trackway through scrub) and adjoining reed swamp

Outside of regular sprainting sites as identified above, holting areas and more open otter resting sites (couches) were also studied in detail. Potential holt sites were a combination of man made structures (1 no.) and natural bankside holes and excavations (6 no.). The rooting zones of oak and hawthorn facilitated some natural holes of various dimensions between 20cm and 40cm +. While numerous small holes existed they were predominantly used by rats and mice. Larger natural excavations were potentially used by fox or otter, but activity in these areas was not recorded apart from fox, rats and mice. Typically areas used by fox were concentrated in areas of gorse scrub that sometimes extended inside the site boundary. Otter activity by contrast was rarily far from the shoreline (approx. 25m from intertidal but typically <10m). Of the numerous initial identified potentially suitable holt sites only was was used by otter with any consistant regularity. This semi-active holt site resulted from an old quarry embankment of boulders surrounded by gorse scrub. Several large voids upto 0.5m width to 0.4m high existed here. While the identified holt site was not considered a natal holt as no young were present at the time of the survey and only one animal was visiting very infrequently (9 triggers over a 45 day period) it is nonetheless considered a resting place. Further regular resting places (3 no. non holt sites) in the form of couches, were located areas of flattened dry grassland strips above the high tide line.

These areas were identified alongside frequent sprainting sites (see Figures 3.2 & 3.3). In summary three regular resting areas were identified broadly overlapping regular sprainting sites and one occasionally used holt (man made). All resting sites and the single active holt were located within 15m of the high tide mark of the intertidal zone. These areas are summarised below;

1. Open grassy embankment adjoining the woodland strip and small point to the north west of the site (two regular couch areas were located here)
2. Manmade holt, where gaps between boulders existed supporting irregular usage by otter (not considered a natal holt at present)
3. The large point and adjoining dry grassy areas to the north east of the site (3 regularly used couch sites located here)
4. The south eastern extent of the site (near trackway through scrub) and adjoining reed swamp (couch area on short grassy promontory)

Threats

According to the Ecological Guidance for Local Authorities & Developers, Scott Cawley (2013) key threats to otter as a result of development include the following;

- Loss of and damage to bankside, coastal and in-stream habitats causing loss of shelter and holt sites by drainage, removal of wet areas, removal of vegetation or landscape features and pollution of waterbodies.
- Fragmentation of commuting routes between feeding areas caused by bridge works, roads, weirs and culverts.
- Loss of feeding areas caused by infilling of wetlands or depreciation of water quality.
- Effects of lighting, noise, vibration and human activity during construction and operation near areas used by otter

Specifically, impacts relating to the proposals at Carcur include disturbance and the removal of habitat. Disturbance would relate to both the operational and construction phases of the development. This would include large machinery disturbance during site clearance and the build phases. Furthermore, potential changes in the levels of human activity on the intertidal zone from walkers would occur during the operational phase. There are proposals to clear the central areas of the site but these areas had no evidence of otter activity, based on numerous site visits, sprainting activity and trail cameras. The central areas of the site as existing comprise mainly partially cleared ground with recolonising grassy patches and scrub on piles of earth. While impacts to otter habitat is not considered to be significant in the central areas of the site given no recorded levels of activity and existing partially cleared ground[2], proposals to remove the freshwater pond (see Figures 3.2 & 3.3) could have potential significant negative impacts. This is considered given that the pond is an important freshwater source for otters to wash their coasts and conenrations of otter activity were noted on the seaward side of the pond (i.e. north side; see Figures 3.2 & 3.3).

[2] Note the site was historically a gravel quarry

5. Mitigation

Summary of Otter usage of the site

Conclusively, the evident pattern of use by otter of the intertidal along a narrow coastal strip at Carcur, can be considered an important area for commuting and feeding otters. It is essential to maintain ecological connectivity for the species between different types of micro-habitat that offer different oppurtunities for otter. Otter appear to move between the reedwamp and tidal channel to the south east of the site and along the intertidal towards the upper River Slaney Estuary (based on the pattern of spraints). At Carcur important connecting habitats bordering the site include the following;

1. Reedswamp, tidal channel and adjoining scrub south of the railway line (i.e. south east of site)
2. Shingle, san and mud intertidal (entire estuarine perimeter)
3. Dry grassy strips adjoining the intertidal, used as sprainting sites
4. Freshwater pond to north east of site
5. Scrub and scattered trees coastal strip providing seclusion along the shoreline

These habitats should be preserved and not damaged during the site clearance phase of the project (i.e. for road and housing construction). The coastal strip of scrub and scattered trees should be marked by boundary fencing in advance of site clearance to avoid destruction and or fragmentation of this habitat. To avoid unnecessary loss of habitat the construction method statement should clearly mark areas to be fenced off in advance of construction commencement that should be agreed with the NPWS. An Ecological Clerk of Works (EcOW) should be commissioned to oversee the site clearance and construction phases to ensure the important habitats used by otter are not disturbed.

Otter Habitat Buffer Zone

Otters are typically known to forage within 80m of the high water mark of the shoreline (NPWS 2007; Kruuk 2006), while a 10m buffer zone into terrestrial habitat from the high water mark may be considered critical (NPWS 2007). Given the development area at Carcur overlaps the River Slaney Estuary SAC it would be essential that the existing scrub habitat is retained and a buffer is kept in place of at least 10-15m. A conservative buffer of 15m (where construction will not take place) will be applied from the banktop bordering the intertidal zone as the banktop is a consistant marker not affected by tidal ranges. It is proposed that the shoreline be fenced off with permanent fencing to prevent access to the shoreline by regular dog walkers. This will help prevent significant changes in the patterns of usage of the shoreline that currently receives moderate footfall. The fence line should also enclose the new proposed otter pond and man made holt as discussed in the extended mitigation below.

Otter Holt

Given the presence of a man-made holt site along the centrepoit of the northern shoreline (ITM 703459, 623447; see Table 3.1 & Figure 3.3) it is important that the activity of this holt area is rechecked immediately prior to construction. This will inform the application of the standard guidance recommended by the National Roads Authority (NRA) in advance of site clearance and works commencement (NRA 2008);

- No works should be undertaken within 150m of any holts at which breeding females or cubs are present.
- Following consutation with NPWS, works closer to such breeding holts may take place provided appropriate mitigation measures are in place, e.g. screening and / or restricted working hours onsite.
- No wheeled or tracked vehicles should be used within 20m of active, but non-breeding otter holts.
- Light work such as digging by hand or scrub clearance should also not take place within 15m of such holts , except under license.
- The prohibited working area associated with otter holts should be fenced off where appropriate with temporary fencing with appropriate signage on exclusion fence, with appropriate communication to site staff of the sensitivity of the area.

In advance of any site clearance, piling, light works or use of plant machinery at the locations of the holting sites, an adequate buffer zone should be agreed in consultation with the NPWS based on the monitoring data along with requirements for a Section 25 derogation under the 1997 Habitats Regulations. The holt area should also be closed off with perimeter fencing in advance of site clearance.

Otter Pond

The current proposed layout will overlap the freshwater pond to the north-east of the site. As a result, the pond would be infilled. To mitigate for the loss of this habitat (that incidentally is important for otter washing their coats), a new compensatory pond will be constructed in the north east of the site.

The pond will be of equal or greater dimensions to the existing freshwater pond (approx. 20m by 15m) with an average depth of 0.75m. The pond should be landscaped with hawthorn and blackthorn scrub at the landward side to provide seclusion for otter. There should also be planting along the fenceline that will be constructed to protect the pond. Prior to the construction of the new pond the old pond should be fenced off in adavance of site clearance to prevent its distruction in advance of the construction of the new pond. The permanent new pond structure will be fenced off at the landward site to prevent access by dogs and people from the adjacent housing development. As described above a line of hawthorn/ blackthorn trees should be planted along the fenceline to help provide seclusion for otter. An indicative location for the new pond has been provided in Appendix B.

Following consultation with the NPWS, the following requirements have been proposed for otter with regard the construction of the new pond (consultation reference **G Pre00280/2015**);

- The new compensatory pond must be built prior to the destruction of the existing freshwater pond.
- The pond design should use current best practice guidance in the construction of such ponds specifically for otter. Detailed design including reference to any guidance documents used must be included in the Planning Application.
- A regime to monitor usage of the pond to determine success of this mitigation must take place prior to the destruction of the existing pond.
- Where otter usage is not found, further mitigation may be required to the initial pond design to increase usage by otter prior to the destruction of the existing pond.
- There are long-term plans for a bridge across the estuary, served by a road which would run through the development and overlap with the proposed new pond location.
- Design of the new pond should take into account this and any other potential future development in its vicinity to safeguard its long-term availability to otters. In addition, in combination impacts of this bridge and the development on otter must be covered in the NIS.

6. Bibliography

Chanin, P. (2003). Ecology of the European Otter. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.

National Roads Authority (2008) Guidelines on the treatment of otters prior to the construction of national road schemes. National Roads Authority, Dublin 4.

NPWS (2011) Conservation Objectives: Slaney River Valley SAC 000781. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Reid, N., Hayden, B., Lundy, M.G., Pietravalle, S., McDonald, R.A. & Montgomery, W.I. (2013) National Otter Survey of Ireland 2010/12. Irish Wildlife Manuals No. 76. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland

APPENDIX A

NPWS Section 9 & 23-6(b) License

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

Licence No. **134/2015**

NATIONAL PARKS & WILDLIFE SERVICE

Wildlife Acts 1976 to 2012 - Sections 9 and 23 (6) (b)

LICENCE TO PHOTOGRAPH/FILM WILD ANIMALS FOR EDUCATIONAL, SCIENTIFIC OR OTHER PURPOSES

The Minister for Arts, Heritage and the Gaeltacht in exercise of the powers conferred on her by Sections 9 and 23 of the Wildlife Acts 1976 to 2012 authorises:

Ross Macklin, 42 Norwood Court, Rochestown, Cork

To photograph/film the species of wild animals specified in Column 1 of the Schedule hereunder in the area specified in Column 2 for educational, scientific or other purposes during the period beginning on the **21st day of December 2015** and ending on the **31st day of March 2016,** subject to the conditions listed overleaf.

Schedule

1	2
Species	**Area(s)**
Otter	Carcur, Co. Wexford

Dated this the 21st day of December 2015
For the Minister for Arts, Heritage and the Gaeltacht

National Parks & Wildlife Services
LICENCE

Conditions

1. This licence shall be produced for inspection on a request being made on that behalf by a member of An Garda Síochána or any person appointed by the Minister for Arts, Heritage and the Gaeltacht under Section 72 of the Wildlife Acts 1976 to 2012, to be an authorised person for the purposes of the Acts.

2. This licence does not confer the right to capture or handle any of the above species.

3. Local National Parks & Wildlife Service staff must be notified and agreement reached before any work can commence at any site.

4. You must liaise with the local Conservation Ranger prior to embarking to photograph/film at any particular location. The local Conservation Ranger must be contacted in advance during business hours.

5. Any query in relation to this licence should be made to National Parks and Wildlife Service, 7 Ely Place, Dublin 2, D02 TW98. Telephone: (01-8883232)

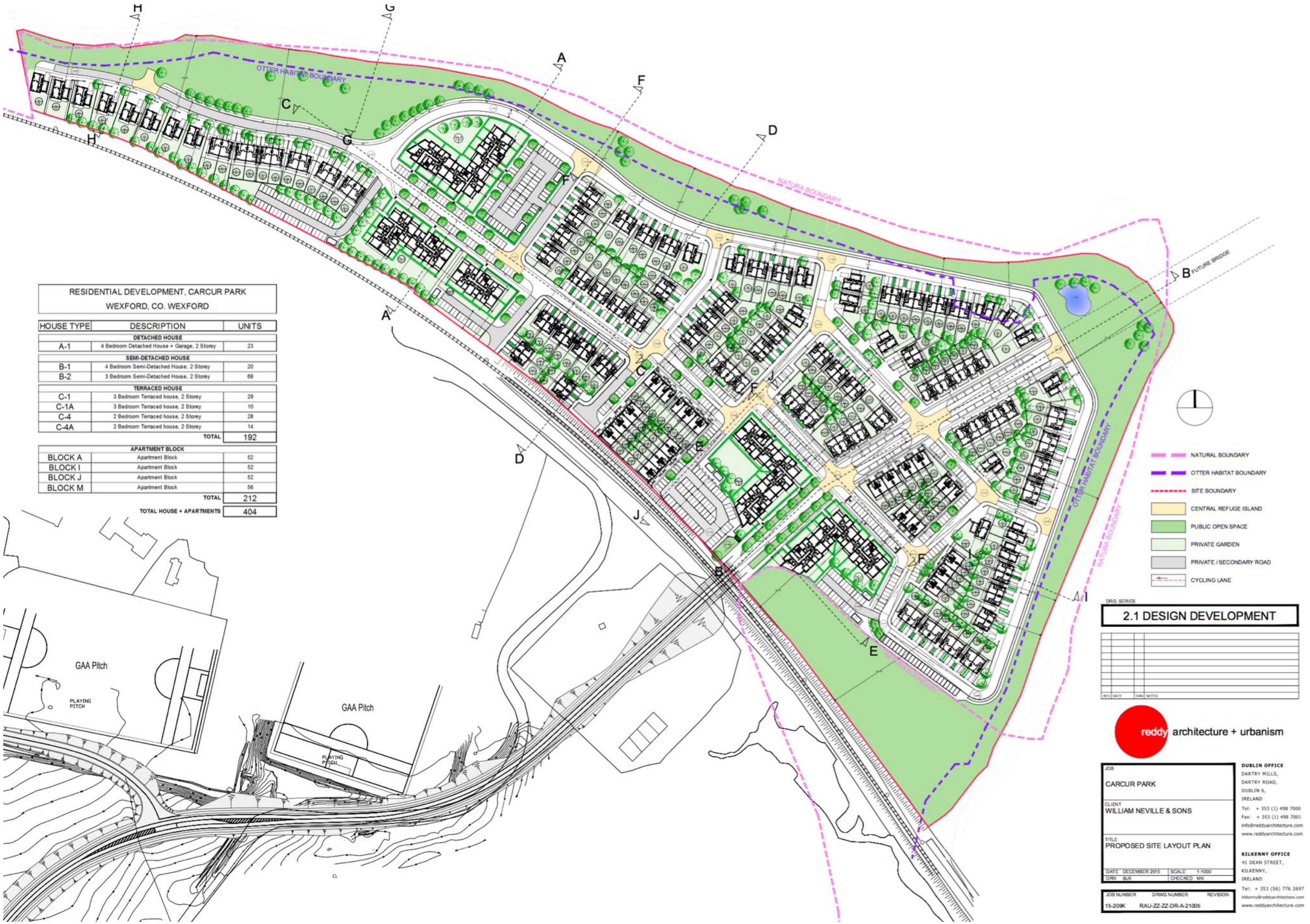
NOTE: This licence does not confer right of entry on any land

National Parks & Wildlife Services
LICENCE

APPENDIX B

Indicative location of proposed Otter Pond

(Prepared by Reddy Architecture)


RESIDENTIAL DEVELOPMENT, CARCUR PARK
WEXFORD, CO. WEXFORD
HOUSE TYPE
DESCRIPTION
UNITS
DETACHED HOUSE
A-1
4 Bedroom Detached House + Garage, 2 Storey
23
SEMI-DETACHED HOUSE
B-1
4 Bedroom Semi-Detached House, 2 Storey
20
B-2
3 Bedroom Semi-Detached House, 2 Storey
68
TERRACED HOUSE
C-1
3 Bedroom Terraced house, 2 Storey
29
C-1A
3 Bedroom Terraced house, 2 Storey
10
C-4
2 Bedroom Terraced house, 2 Storey
28
C-4A
2 Bedroom Terraced house, 2 Storey
14
TOTAL
192
APARTMENT BLOCK
BLOCK A
Apartment Block
52
BLOCK I
Apartment Block
52
BLOCK J
Apartment Block
52
BLOCK M
Apartment Block
56
TOTAL
212
TOTAL HOUSE + APARTMENTS
404
OTTER HABITAT BOUNDARY
NATURA BOUNDARY
FUTURE BRIDGE
GAA Pitch
PLAYING PITCH
GAA Pitch
PLAYING PITCH
NATURAL BOUNDARY
OTTER HABITAT BOUNDARY
SITE BOUNDARY
CENTRAL REFUGE ISLAND
PUBLIC OPEN SPACE
PRIVATE GARDEN
PRIVATE / SECONDARY ROAD
CYCLING LANE
DRG. SERIES
2.1 DESIGN DEVELOPMENT
REV DATE DRN NOTES
reddy architecture + urbanism
JOB
CARCUR PARK
CLIENT
WILLIAM NEVILLE & SONS
TITLE
PROPOSED SITE LAYOUT PLAN
DATE DECEMBER 2015
SCALE 1-1000
DRN BLR
CHECKED MK
JOB NUMBER
DRWG NUMBER
REVISION
15-209K
RAU-ZZ-ZZ-DR-A-21005
DUBLIN OFFICE
DARTRY MILLS,
DARTRY ROAD,
DUBLIN 6,
IRELAND
Tel: + 353 (1) 498 7000
Fax: + 353 (1) 498 7001
info@reddyarchitecture.com
www.reddyarchitecture.com
KILKENNY OFFICE
41 DEAN STREET,
KILKENNY,
IRELAND
Tel: + 353 (56) 776 2697
kilkenny@reddyarchitecture.com
www.reddyarchitecture.com

Appendix 6.3 Detailed bird survey report

CARCUR PARK DEVELOPMENT: WATERBIRD REPORT

Tom Gittings BSc, PhD, MCIEEM
Ecological Consultant
3 Coastguard Cottages
Roches Point
Whitegate
CO. CORK
www.gittings.ie

REPORT NUMBER: 1509-F1
STATUS OF REPORT: Revision 1
DATE OF REPORT: 23 February 2016

CONTENTS

1. INTRODUCTION

1.1. TERMS OF REFERENCE

This report was commissioned by William Neville and Sons. The purpose of the report is to inform the assessment of the potential impacts of the proposed housing development at Carcur Park on the waterbird populations of the Wexford Harbour and Slobs SPA.

The report includes a review of existing waterbird data that is relevant to the assessment, and the results of waterbird surveys that were carried out between September 2015 and January 2016 for the present assessment. These surveys included: full low tide counts of the Ferrybank (Wexford Bridge) - Castlebridge (0O407) subsite of Wexford Harbour, ebb/flood tide and high tide counts of the area around the proposed development site, and recording of the disturbance responses of waterbirds in this area.

1.2. TERMINOLOGY

Development site: the site of the proposed Carcur Park housing development.

Ferrycarrig subsite: the Ferrybank (Wexford Bridge) - Castlebridge (0O407) subsite used in I-WeBS and WSP counts of Wexford Harbour.

I-WeBS: the Irish Wetland Bird Survey.

RD: the response distance used for the disturbance recording, defined as the distance of a bird from a disturbance source when it showed a disturbance response, or, for birds that did not show a disturbance response, the closest distance to which the bird was approached by the disturbance source.

SCI: Special Conservation Interest.

SPA: Special Protection Area.

Wexford Bay: the site used for waterbird monitoring comprising the Wexford Harbour and Slobs SPA downstream of Wexford Bridge, and the Raven SPA.

WSP: the 2009/10 Waterbird Survey Programme as undertaken by the National Parks & Wildlife Service.

2. METHODOLOGY

2.1. STUDY AREA

The Wexford Harbour and Slobs SPA is a large site extending from Enniscorthy along the River Slaney to Wexford Harbour and including the North and South Slobs (Figure 1). Within the SPA, the area between Wexford Bridge and Ferrycarrig Bridge forms a discrete unit of estuarine habitat, which can be distinguished from the main harbour downstream of Wexford Bridge (dominated by open sandflats) and the tidal river habitat upstream of Ferrycarrig Bridge. This area is recognised as a distinct subsite for the purposes of waterbird monitoring (the Ferrycarrig subsite). The development site is in the middle of the southern shore of the Ferrycarrig subsite. Therefore, the Ferrycarrig subsite was defined as the main study area for this assessment.

2.2. REVIEW OF EXISTING WATERBIRD DATA

For the purposes of waterbird monitoring, the Wexford Harbour and Slobs SPA has been divided into two sites: the River Slaney and Wexford Bay (Figure 2). The River Slaney site extends from Enniscorthy to Ferrycarrig Bridge. The Wexford Bay site includes the Wexford Harbour and Slobs SPA downstream of Ferrycarrig Bridge and the Raven SPA. The Wexford Bay site is divided into a number of subsites. It should be noted that the subsites do not include the middle of the main harbour and areas of sandbank at the mouth of the harbour are not covered by the subsites. Therefore, waterbird counts for Wexford Bay will tend to underestimate the total numbers that occur in the harbour.

Existing waterbird data for Wexford Bay includes annual I-WeBS counts and the WSP counts carried out in 2009/10.

I-WeBS coverage of Wexford Bay has been very patchy and there have only been a handful of complete counts since 1996/97 (unpublished review of I-WeBS coverage carried out for the Marine Institute). On I-WeBS counts, the Ferrycarrig subsite is mainly counted on ebb tides (unpublished review of I-WeBS coverage carried out for the Marine Institute). As waterbird usage of the Ferrycarrig subsite is fluid at this time (see Section 3.2.2), it is difficult to interpret the significance of these counts. Therefore, I-WeBS counts do not provide accurate data on waterbird numbers in Wexford Harbour, and are not very useful for assessing usage of the Ferrycarrig subsite, and I have, therefore, not used I-WeBS data in this assessment.

The WSP counts provide more systematic coverage of Wexford Harbour and included four low tide counts and one high tide count. In addition, a separate high tide roost survey was carried out to map roost locations, and information on potentially disturbing activities was recorded during all the counts. General details of the NPWS BWS methodology are provided by Lewis and Tierney (2014), while details of the NPWS BWS methodology and results at Wexford Harbour and the Raven are described in Cummins and Crowe (2010) and NPWS (2011).

2.3. 2015/16 WATERBIRD COUNTS

2.3.1. Survey objectives

The purpose of the waterbird counts carried out for this assessment was to establish the total numbers of waterbirds using the Ferrycarrig subsite at low tide, and to record the waterbird usage of the areas adjoining the development site at various tidal stages (low, ebb/flood and high tide)

2.3.2. Count sectors

The Ferrycarrig subsite was divided into 13 sectors for the purposes of this study (Figure 3). The sectors were primarily designed to cover the intertidal habitat and the boundaries between the sectors in the middle of the subsite (i.e., within the subtidal zone) are somewhat arbitrary. The saltmarsh habitat at the northern end of the subsite was not counted.

Two sectors (S4 and S5) covered the sections adjoining the proposed development site, and a further two sectors (S3 and S6) covered adjacent areas. Sector S4 was defined as a narrow sector to represent the shingle shoreline along the eastern boundary of the site. When continuous intertidal habitat was exposed connecting S4 and S3, the boundary between the two sectors was defined as a minor tidal channel that ran parallel to the S4 shoreline, about 40 m out from the shoreline. Sector S3m includes the reedbed in the south-eastern corner of the development site and the tidal habitat impounded by the railway line. The remaining sectors were defined mainly to help organise the low tide counts and avoid double-counting.

2.3.3. Count dates and timings

Counts were carried out on eight dates over the period September 2015-January 2016. On each count date, a full low tide count of the Ferrycarrig subsite was carried out. In addition, flood/ebb tide and high tide counts of the sectors adjacent to the development site (S3-S6) were also carried out. However, high tide counts were not carried out on 15/09/2015 (as I carried out an initial site reconnaissance before starting the counts on that date), or on 10/12/2015 (as there was no daylight high tide). The high and low tide counts were generally carried out in three hour windows centred on low, or high, tide (Table 1). However, the first three low tide counts were not completed until 1.75-2 hours after low tide due to the large numbers of birds present. The ebb/flood tide counts were carried out between the low and high tide count windows. Weather conditions during the counts were generally good (Table 2). However, due to early starts, the visibility was only moderate for the start of the low tide count on 23/11/2015 and for the ebb tide count on 10/12/2015.

Table 1. Count timings in relation to tidal conditions.

Date	Low tide		High tide		Count timings		
	time	height	time	height	low tide	flood/ebb	high tide
15/09/2015	15:47	0.6	08:53	1.9	15:03-17:33	12:30-12:51	no count
29/09/2015	15:25	0.4	08:28	2.0	14:03-17:20	12:25-13:13	09:05-09:34
08/10/2015	09:29	0.8	16:30	1.6	08:12-11:34	13:52-14:20	15:45-16:36
29/10/2015	14:44	0.5	07:48	2.1	13:10-15:49	11:47-12:22	07:40-08:45
23/11/2015	10:06	0.6	16:27	1.9	08:20-11:12	12:09-12:45	16:07-16:34
10/12/2015	12:14	0.6	05:43	1.8	10:25-11:12	08:31-08:50	no count
08/01/2016	11:37	0.7	17:35	1.9	10:08-12:16	08:38-09:04	16:06-16:14
27/01/2016	15:32	0.8	08:59	2.1	13:59-16:23	11:57-12:29	08:46-09:35

Tidal data from Admiralty EasyTide (www.ukho.gov.uk/).

Table 2. Weather conditions.

Date	Count	Cloud	Rain	Visibility	Wind
15/09/2015	LT	1	1	1	W1
	EBB	1	1	1	SW3
29/09/2015	HT	1	1	1	E3
	LT	1	1	1	E2
	EBB	1	1	1	E3
08/10/2015	HT	2	1	1	SW3
	LT	2	1	1	0 becoming SW2
	FLOOD	2	1	1	SW3
29/10/2015	HT	2	1	1	SE1
	LT	3	2	1	SE2
	EBB	1	1	1	SE2
23/11/2015	HT	3	1	1	SW4
	LT	3	1	1-2	0 becoming SW2
	FLOOD	3	1	1	SW3
10/12/2015	LT	3	1	1	S2
	EBB	2	1	2	S1
08/01/2016	HT	3	1	1	SW3
	LT	1	1	1	SW3

Date	Count	Cloud	Rain	Visibility	Wind
	EBB	1	1	1	SW3
27/01/2016	LT	2	1	1	NW5
	EBB	3	1	1	NW5
	HT	2	1	1	NW5

Cloud: 1 = 0-33%; 2 = 34-66%; 3 = 67-100%.
Rain: 1 = none; 2 = showers; 3 = drizzle.
Visibility: 1 = good; 2 = moderate; 3 = poor.
Wind: Beaufort scale and direction.

2.3.4. Count methodology

Apart from on the first count, the low tide counts began at the upper end of the subsite with counts of S10-S12 from VP1 and VP2, and then worked clockwise around the subsite to finish with counts of S7-S9 from VP8 and VP9 (Table 3). The sectors adjoining the development site (S3-S6) were always counted within 30 minutes of the official low tide time. Two of the vantage points were accessed by walking along the shoreline: VP1 and VP5. Accessing VP1 caused disturbance to birds in the southern part of S12 and the northern part of S13, while accessing VP5 caused disturbance to birds in the southern part of S13. I generally arrived at VP1 15-30 minutes before the start of the count period, which allowed birds to settle back into S12. Numbers of birds in S13 were low and I was able to keep track of birds that I flushed to avoid potential double-counting.

On the first count, I attempted to count S10-S12 at the end of the count from VP3, and other vantage points along the same road. This did not allow complete coverage of Sector S10 and, as S10 usually holds significant numbers of waterbirds, the overall subsite totals for several species are likely to be significant underestimates.

On the first two low tide counts, I counted S3, S4, S5 and S6 from vantage points within the development site. However, this caused logistical problems due to the time take to access the vantage points, and also caused disturbance to birds within S4 and S5 (although, due to the low numbers present, the disturbance did not significantly affect the overall counts).

On the ebb/flood and high tide counts, alternative vantage points were used when VP5 was not accessible due to the tide (Table 3).

I classified all birds that I counted by tidal zone (Table 4) and behaviour (feeding, flying or roosting/other).

Table 3. Vantage points used for the waterbird counts.

Vantage Point	Sectors covered	Notes
VP1	S10, S11 and S12 (part)	
VP2	S13 (part)	
VP3	S12 (part)	
VP4	S1 and S2	
VP5	S3-S6	
VP5a	[S3, S4] and S13 (part)	Used to count S3-S4 when VP5 was inaccessible on spring high tides
VP6 and VP7	S4 (marsh)	
VP8	S7 (part), S8 and S9	
VP9	[S5 and S6], S7 (part)	Used to count S5-S6 when VP5 was inaccessible on spring high tides

Table 4. Tidal zones.

Tidal zone	Definition
Supratidal	Above the maximum high water level, including birds roosting on the railway line, etc.
Saltmarsh	
Tideline	On, or close to the tideline
Shallow subtidal	The subtidal zone adjacent to the tideline that it shallow enough for birds to wade in at low tide.
Deep subtidal	The subtidal zone below the shoreline.

2.4. DISTURBANCE RECORDING

2.4.1. Activity

On each visit, a detailed record was kept of human activities with the potential to cause disturbance to waterbirds in the study area. This included all activity in the intertidal and subtidal zones, as well as any activity in adjoining supratidal zones (apart from along roads, etc.). The following parameters were recorded: time, location, number of people, number and type of animals (if any), type of vehicle (if any), nature of activity (e.g., walking the shoreline, bait-digging, etc.), and any disturbance responses caused by the activity.

2.4.2. Disturbance responses

On most visits, I recorded the responses of birds in intertidal habitat in the sectors adjoining the development site (S3-S6) to disturbance caused by my presence, and/or by other human activity. On the first two visits, these responses were recorded while I was carrying out the low tide count from the development site. On subsequent visits (when I carried out the low tide count from vantage points outside the development site), I visited the development site after the low tide count for the specific purpose of recording disturbance responses. I also recorded disturbance responses on 24/11/2015 while carrying out an Otter survey.

On each disturbance recording session, the positions (relative to the disturbance source) and responses of all birds in the intertidal zone of S3-S5 were recorded using the parameters listed in Table 5. During most sessions, there was no significant exposure of intertidal mud adjacent to the shoreline, and the response distance, and distance moved, were recorded 'as the crow flies' distances. On sessions where there was intertidal mud exposed adjacent to the shoreline, and the shoreline was walked, the response distance and distance moved were recorded as both direct ('as the crow flies' distances), and as lateral distances (i.e., the perpendicular distance from the shoreline).

Table 5. Disturbance parameters recorded.

Parameter	Definition
Time	Time of observation
Response distance	Distance of bird from disturbance source when it showed a disturbance response; if bird did not show a disturbance response the closest distance to which the bird was approached was recorded
Response	No response Alert response Walked away Flushed
Resettling location	Location where bird resettled after being disturbed. Where birds were flushed from S4 and flew north and east following the shoreline, they were assumed to have moved to S5. Similarly, where birds were flushed from S5 and flew east and south following the shoreline, they were assumed to have moved to S3/S4.

3. RESULTS

3.1. 2009/10 WATERBIRD SURVEY

The numbers of waterbirds recorded in the Ferrycarrig subsite in the 2009/10 WSP low tide counts are compared with the total Wexford Bay count in Table 6. The species that occurred in relatively high numbers in the Ferrycarrig subsite included Goldeneye, Black-tailed Godwit, Greenshank and Redshank. During the single high tide count (21/01/2010), only six species were recorded in the Ferrycarrig subsite, with a total of 24 counted across all these species. Information from this high tide count, a high tide roost survey on 08/03/2010 and various other sources was used to map the distribution of high tide roosts in the Wexford Bay site in NPWS (2011). This mapping shows four high tide roosts within the Ferrycarrig subsite, all located along the northern/eastern shore of the subsite. The species listed as using these roosts are Mallard, Little Egret, Oystercatcher, Black-tailed Godwit, Curlew and Black-headed Gull. No information is provided on the size of these roosts.

Table 6. Comparison of total waterbird numbers in Wexford Bay with the numbers in the Ferrycarrig subsite (0O407) during the 2009/10 low tide counts.

	15/10/2009		20/11/2009		15/12/2009		15/02/2010		0O407 mean	
	Total	0O407	Total	0O407	Total	0O407	Total	0O407	count	% of total
Mute Swan	124	0	97	4	75	3	49	4	33	4%
Shelduck	4	0	120	0	465	0	439	18	149	1%
Teal	552	0	535	0	376	0	88	2	143	1%
Goldeneye	7	0	50	1	46	8	20	18	20	36%
Red-breasted Merganser	314	0	135	0	86	14	73	2	44	5%
Great Crested Grebe	38	6	137	20	54	1	63	28	44	19%
Cormorant	626	17	272	2	170	15	206	4	98	4%
Little Egret	93	10	51	3	30	4	5	0	15	10%
Grey Heron	57	4	36	7	22	2	9	0	11	12%
Oystercatcher	1171	43	300	6	327	16	336	71	157	8%
Ringed Plover	76	0	52	0	25	12	0	0	13	16%
Grey Plover	45	0	97	0	128	5	246	3	68	1%
Lapwing	356	35	3669	0	3666	558	4113	691	1819	10%
Dunlin	646	0	927	1	2301	2	2607	2	834	0%
Black-tailed Godwit	1739	676	1849	0	323	74	240	182	478	34%
Bar-tailed Godwit	966	0	471	0	580	7	984	14	294	1%
Curlew	1062	38	843	4	456	22	973	172	358	7%
Greenshank	15	4	14	3	25	4	10	5	9	29%
Redshank	1016	256	432	43	569	66	576	258	314	23%
Turnstone	64	2	54	10	50	14	57	3	27	14%
Black-headed Gull	4086	1092	1816	150	820	23	1340	158	771	12%
Common Gull	241	4	423	0	412	0	1131	0	281	0%
Lesser Black-backed Gull	325	0	93	23	21	0	84	0	32	8%
Herring Gull	105	2	85	1	192	1	110	3	56	2%

	15/10/2009		20/11/2009		15/12/2009		15/02/2010		0O407 mean	
	Total	0O407	Total	0O407	Total	0O407	Total	0O407	count	% of total
Great Black-backed Gull	226	3	78	0	17	1	51	1	22	1%

Data source: 2009/10 Waterbird Survey Programme as undertaken by the National Parks & Wildlife Service.

3.2. 2015/16 WATERBIRD COUNTS

3.2.1. Tidal exposure patterns

The extent of intertidal habitat shown in Ordnance Survey mapping of Wexford Harbour, and used by NPWS in mapping for their conservation objectives, is based on historical data and bears no relationship to the current situation. The typical extent of intertidal habitat exposed at low tide on a moderate spring tide in the Ferrycarrig subsite is shown in Figure 4. The most extensive area of intertidal habitat is in S10 and S11 at the northern end of the subsite. Other significant areas of intertidal mudflat are regularly exposed in S1, S6 and S8. In S2, S3, S5, S6, S7 and S12 intertidal mudflat tends to only be exposed on the lower tides. The other sectors (S4, S9 and S13) hold shingle shorelines with minimal exposure of intertidal mudflats at low tide.

The degree of exposure of intertidal mudflat at low tide was very sensitive to the tidal conditions. On 29th September on a low spring tide (0.4 m), there was very extensive exposure of mudflat across the northern end of the subsite (S10-S12), with the remaining subtidal area only very shallowly flooded (birds were wading in the subtidal water in the middle of these sectors. Also, on this date there was extensive exposure of intertidal mudflat in S5, with a mud bar extending almost up to the spit at the eastern end of this sector.

The relative degree of exposure of intertidal mudflat in the sectors adjoining the development site on each count day is indicated in Table 7. It should be noted that the exposure pattern does not precisely follow the predicted low tide height, due to the influence of atmospheric conditions on the tide.

Table 7. Exposure of mudflat in the sectors adjoining the development site.

Date	Low tide height (m)	S3	S5	S6
15/09/2015	0.6	moderate	none	major
29/09/2015	0.4	major	major	major
08/10/2015	0.8	minor	none	major
29/10/2015	0.5	minor	none	major
23/11/2015	0.6	moderate	none	major
10/12/2015	0.6	minor	none	moderate
08/01/2016	0.7	none	none	none
27/01/2016	0.8	minor	none	minor

Tidal data from Admiralty EasyTide (www.ukho.gov.uk/).

3.2.2. Waterbird occurrence patterns in the Ferrycarrig subsite

Across all the low tide counts, 21 of the 32 SCI species of the Wexford Harbour and Slobs SPA were recorded in the study area (Table 8). The SCI species that were not recorded included species that mainly occur on the slobs (Bewick's Swan, Whooper Swan and Greenland White-fronted Goose), one species that is now rather rare in Wexford Harbour (Scaup), a raptor (Hen Harrier), a wader associated with more sandy sediments (Sanderling), and a breeding tern species (Little Tern). Somewhat more surprising were the absence of any records of the remaining two SCI species: Light-bellied Brent Goose and Golden Plover. However, neither of these species was recorded in the Ferrycarrig subsite during the 2009/10 WSP counts (see 3.1). A further 15 non-SCI species were recorded on the low tide counts (Table 9). These included four species that were present on all, or nearly all, of the counts: Little Egret, Greenshank, Herring Gull and Great Black-backed Gull.

General observations indicated that many waterbirds move out of the Ferrycarrig subsite at high tide. Flocks of Black-tailed Godwit were regularly observed flying into the subsite on the ebb tide and flying out of the subsite on the flood tide, either following the central channel to/from Wexford Bridge, or flying overland between the northern end of the subsite and the North Slob. Similar movement patterns were also observed (but less frequently) for Knot, Dunlin and Bar-tailed Godwit. At high tide, small roosts of Oystercatcher, Redshank and Greenshank sometimes occur in S3 and S4 (see Section 3.2.3). General searches of the subsite for high tide roosts away from S3-S6 were carried out on 08/10/2015 and 29/10/2015. On the first date, a roost of around 70 Oystercatcher, 100 Black-tailed Godwit and 50 Redshank was found on the shingle ridge at the southern end of S12. This roost was not occupied on 29/10/2015, and apart from this roost, the only other shoreline roosting waterbirds found were scattered individuals/small groups of Grey Heron, Little Egret, Oystercatcher, Greenshank and Redshank. These observations support the indications from the WSP counts that the Ferrycarrig subsite generally does not support significant numbers of shoreline roosting waterbirds at high tide.

3.2.3. Waterbird occurrence patterns in the sectors adjoining the development site

Across all counts the following SCI species were recorded in the sectors adjoining the development site: Shelduck, Mallard, Red-breasted Merganser, Cormorant, Grey Heron, Little Grebe, Oystercatcher, Lapwing, Curlew, Black-tailed Godwit, Bar-tailed Godwit, Redshank, Black-headed Gull, and Lesser Black-backed Gull (Table 10-Table 12). A further nine non-SCI species were also recorded: Cormorant, Little Egret, Turnstone, Spotted Redshank, Greenshank, Sandwich Tern, Common Gull, Herring Gull and Great Black-backed Gull (Table 10-Table 12). The species that occurred regularly (i.e., on 50% or more of the low tide counts) included: Cormorant, Little Egret, Grey Heron, Little Grebe, Oystercatcher, Curlew, Black-tailed Godwit, Greenshank, Redshank, Black-headed Gull, Herring Gull and Great Black-backed Gull. All further analyses are restricted to these species.

Across all the regularly occurring species there was a general pattern of more regular occurrence, and higher numbers, at low tide compared to the ebb/flood and high tides (Table 13). Most species also occurred more regularly, and in higher numbers, on the ebb/flood tide compared to at high tide (Table 13).

Feeding Cormorant and Little Grebe occurred in small numbers in the subtidal waters in these sectors. Roosting Cormorant also occurred on three dates at low tide on the gravel spit exposed off the north-eastern corner of the development site with a maximum count of 10 on 29/10/2015.

At low tide, Little Egret, Grey Heron, Curlew and Greenshank mainly occurred in small numbers distributed rather evenly across the intertidal and shallow subtidal zones throughout these sectors. However, a relatively high count of 12 Little Egrets was recorded at low tide on 15/09/2015 in S6. These species tended to occur less frequently on the ebb/flood and high tide counts due to the more restricted availability of intertidal habitat at these times. However, Greenshank was an exception to this pattern, with high counts on ebb/flood tides in S4 (8 on 29/10/2015 and 21 on 27/01/2016), and at high tide in S3 (13 on 29/10/2015 roosting with Redshank on broken stonework along the railway embankment).

At low tide, Oystercatchers particularly favoured the gravel spit at the eastern end of S5, and birds remained here on ebb/flood tides on some days. Oystercatchers also regularly occurred on the shingle bank in S4 on low tide and ebb/flood tides. At high tide, small roosts were recorded on the railway line in S3 (four dates) and on the shingle bank in S4 (on 23/11/2015).

Black-tailed Godwit showed variable patterns of occurrence, reflecting both variation in total numbers present within the subsite, as well as the patterns of tidal exposure. On 10/12/2015 and 08/01/2016, Black-tailed Godwits were almost completely absent from the Ferrycarrig subsite and no birds were recorded in the sectors adjoining the development site. On the other low tide counts small flocks were recorded in S3, S5 and S6. The high count in S5 on 29/09/2015 reflects the low spring tide conditions which allowed exposure of a mudbank in this sector. Black-tailed Godwit were only recorded once on the ebb/flood tide and were not recorded at all at high tide. This reflects the fact that the Black-tailed Godwit that feed in the Ferrycarrig subsite at low tide move out to the main harbour and/or the North Slob at high tide (see Section 3.2.2).

At low tide, Redshank mainly occurred in S3 and S6 with relatively high numbers in these sector in September and October, reflecting the high numbers present in the subsite at this time. A high count occurred in S5 on 29/09/2015 when a mudbank was exposed on the low spring tide. The low numbers in S6 in the January counts reflected the minimal exposure of mudbank in this sector. Redshank usually remained present on ebb/flood tides, showing varying patterns of distribution between sectors. At high tide, Redshank roosted on broken stonework along the railway embankment in S3 in September and October and on the shingle bank near the southern end of S4 on 23/11/2015.

Small numbers of Black-headed Gull occurred in both intertidal and subitdal habitat throughout these sectors at low tide, with high numbers feeding in shallow subtidal habitat in S6 during the October low tide counts. During ebb/flood tide and high tide counts, small numbers roosted along the shoreline, and in subtidal water, in S3. The main nocturnal Black-headed Gull roost in Wexford Harbour appears to be in the main harbour off Ardcavan and I did not find any evidence of nocturnal gull roosts in the vicinity of the development site.

Herring Gull and Great Black-backed Gulls mainly occurred in small numbers feeding in intertidal and shallow subtidal habitat and roosting in subtidal habitat throughout these sectors, usually with smaller numbers/less frequent occurrence on ebb/flood tides and at high tide.

3.2.4. Importance of the sectors adjoining the development site

The most important areas of low tide habitat in the sectors adjoining the development site are the mudflats in S3 and S6, with the latter area extending into S5 on low spring tides. The gravel spit at the eastern end of S5 can hold small concentrations of waterbirds and may be used as a resting area by flocks moving through the estuary. Small high tide roosts of Oystercatcher, Greenshank and Redshank occur irregularly along the railway line in S3 (about 100-200 m east of the eastern side of the development site) and on the shingle bank at the southern end of S4.

The relative importance of the sectors (S3-S6) adjoining the development site for the regularly occurring waterbird species is shown in Table 17. This shows the mean percentage of the total Ferrycarrig low tide counts that occurred within these sectors. For most species, the sectors held around 15-30% of the total subsite count. However, only 2-3% of the Black-tailed Godwit and Curlew counts occurred within these sectors. If the overall distribution of waterbirds during the 2009/10 low tide counts is considered representative, then these sectors may hold 0-5% of the total Wexford Harbour population of these species (Table 17), while Sectors S4-S5 (the sectors directly adjacent to the development site), may hold 0.1-2.2% of the total Wexford Harbour population of these species.

Table 8. Total low tide numbers of SCI species in the 2015/16 waterbird counts.

Species	15/09	29/09	08/10	29/10	23/11	10/12	08/01	27/01
Shelduck	0	0	0	2	7	0	0	0
Wigeon	0	0	0	0	2	0	0	0
Teal	0	2	0	0	31	13	0	0
Mallard	26	1	45	41	124	99	20	14
Goldeneye	0	0	0	1	8	27	54	25
Red-breasted Merganser	0	0	0	1	0	5	9	13
Cormorant	34	30	48	25	21	11	6	7
Grey Heron	33	9	20	29	15	13	7	5
Little Grebe	0	0	0	25	25	7	7	3
Great Crested Grebe	0	2	0	11	30	1	1	3
Oystercatcher	77	93	119	106	68	62	53	72
Grey Plover	0	0	11	21	2	0	0	0

Species	15/09	29/09	08/10	29/10	23/11	10/12	08/01	27/01
Lapwing	3	38	68	3	754	48	313	0
Curlew	103	171	99	84	83	40	21	44
Black-tailed Godwit	845*	2972	840	1204	1527	3	2	1032
Bar-tailed Godwit	10	28	43	26	27	29	27	77
Knot	500	260	282	244	48	0	0	0
Dunlin	100	140	38	7	131	0	0	0
Redshank	169*	275	278	209	150	213	45	109
Black-headed Gull	355*	1150	1933	881	996	318	301	291
Lesser Black-backed Gull	4	6	36	5	0	1	0	2

* probably a significant undercount (see Section 2.3.4).

Table 9. Total low tide numbers of non-SCI species in the 2015/16 waterbird counts.

Species	15/09	29/09	08/10	29/10	23/11	10/12	08/01	27/01
Mute Swan	0	0	0	0	5	6	0	0
Long-tailed Duck	0	0	0	0	0	0	1	0
Shag	1	0	0	0	0	0	0	0
Little Egret	38	22	21	16	3	5	9	5
Moorhen	1	0	0	0	0	0	0	0
Ringed Plover	0	0	0	0	1	0	0	0
Turnstone	0	0	8	0	0	2	0	0
Common Sandpiper	0	0	1	0	0	0	0	0
Greenshank	5	7	19	13	4	6	15	9
Wood Sandpiper	1	0	0	0	0	0	0	0
Sandwich Tern	4	0	0	0	0	0	0	0
Common Gull	0	21	3	1	0	18	0	0
Herring Gull	12	18	12	13	0	2	6	10
Great Black-backed Gull	18	61	22	44	1	3	1	5
Kingfisher	0	0	1	0	1	0	0	0

Table 10.Low tide totals for the sectors adjoining the development site (S3-S6) in the 2015/16 waterbird counts.

Species	15/09	29/09	08/10	29/10	23/11	10/12	08/01	27/01
Shelduck*	0	0	0	0	3	0	0	0
Red-breasted Merganser*	0	0	0	1	0	0	1	0
Cormorant*	2	3	2	7	14	0	0	0
Little Egret	18	5	4	3	0	1	4	2
Grey Heron*	5	0	7	6	3	4	3	1
Little Grebe*	0	0	0	3	5	6	7	2
Oystercatcher*	20	9	29	23	8	11	0	10
Lapwing*	0	0	0	0	1	0	0	0
Curlew*	4	4	8	3	4	1	0	0
Black-tailed Godwit*	17	64	53	12	28	0	0	290
Bar-tailed Godwit*	2	0	1	0	0	0	0	0
Turnstone	0	0	5	0	0	0	0	0
Greenshank	2	2	6	2	2	3	3	3
Redshank*	48	43	46	31	15	19	8	15
Sandwich Tern	3	0	0	0	0	0	0	0
Black-headed Gull*	38	9	322	119	60	44	13	42

Species	15/09	29/09	08/10	29/10	23/11	10/12	08/01	27/01
Common Gull	0	1	3	0	0	2	0	0
Lesser Black-backed Gull*	0	5	10	1	0	0	0	0
Herring Gull	2	2	3	4	0	1	2	2
Great Black-backed Gull	9	2	6	21	0	2	0	2

* SCI species.

Table 11.Ebb/flood tide totals for the sectors adjoining the development site (S3-S6) in the 2015/16 waterbird counts.

Species	15/09	29/09	08/10	29/10	23/11	10/12	08/01	27/01
Shelduck*	0	0	0	0	4	0	0	0
Red-breasted Merganser*	0	0	0	1	0	3	0	0
Cormorant*	0	0	1	0	1	1	0	0
Little Egret	0	0	4	0	0	0	0	3
Grey Heron*	0	1	2	4	3	1	0	0
Little Grebe*	0	0	0	3	0	5	1	0
Great Crested Grebe*	0	0	0	0	0	2	0	0
Oystercatcher*	11	15	6	43	19	5	0	2
Curlew*	0	2	1	5	0	0	0	0
Black-tailed Godwit*	0	4	0	0	0	0	0	0
Bar-tailed Godwit*	3	0	0	0	0	0	0	0
Turnstone	0	0	0	0	5	0	0	0
Spotted Redshank	0	0	0	0	0	1	0	0
Greenshank	0	2	4	9	2	2	3	21
Redshank*	6	44	7	19	4	15	12	0
Sandwich Tern	1	0	0	0	0	0	0	0
Black-headed Gull*	5	21	9	14	2	7	0	32
Lesser Black-backed Gull*	0	2	0	0	0	0	0	0
Herring Gull	1	2	2	2	0	0	0	2
Great Black-backed Gull	14	3	0	6	0	0	0	0

* SCI species.

Table 12.High tide totals for the sectors adjoining the development site (S3-S6) in the 2015/16 waterbird counts.

Species	15/09	29/09	08/10	29/10	23/11	10/12	08/01	27/01
Shelduck*	No count	0	0	2	0	No count	0	0
Mallard*		0	0	1	0		0	0
Red-breasted Merganser*		0	0	0	0		0	5
Cormorant*		1	0	0	0		0	1
Little Egret		1	0	2	2		0	0
Grey Heron*		3	0	2	2		0	1
Little Grebe*		0	0	2	1		3	1
Great Crested Grebe*		0	0	0	0		0	2
Oystercatcher*		7	3	9	15		0	5
Lapwing*		0	0	0	0		0	15
Curlew*		0	1	1	0		0	0
Turnstone		0	10	3	0		0	0
Greenshank		3	8	15	4		0	0
Redshank*		8	20	9	27		0	0

Species	15/09	29/09	08/10	29/10	23/11	10/12	08/01	27/01
Black-headed Gull*		6	2	10	0		1	24
Lesser Black-backed Gull*		0	1	0	0		0	0

* SCI species.

Table 13.Summary of the numbers of regularly occurring waterbird species recorded at low, ebb/flood and high tides in the sectors adjoining the development site during the 2015/16 waterbird counts.

Species	Low tide			Ebb/flood tide			High tide		
	median	range	n > 0	median	range	n > 0	median	range	n > 0
Cormorant*	2	0-14	5	0	0-1	3	0	0-1	2
Little Egret	3.5	0-18	7	0	0-4	2	0.5	0-2	3
Grey Heron*	3.5	0-7	7	1	0-4	5	1.5	0-3	4
Little Grebe*	2.5	0-7	5	0	0-5	3	1	0-3	4
Oystercatcher*	10.5	0-29	7	8.5	0-43	7	6	0-15	5
Curlew*	3.5	0-8	6	0	0-5	3	0	0-1	2
Black-tailed Godwit*	14.5	0-64	5	0	0-4	1	0	0	0
Greenshank	2.5	2-6	8	2.5	0-21	7	3.5	0-15	4
Redshank*	25	8-48	8	9.5	0-44	7	8.5	0-27	4
Black-headed Gull*	43	9-322	8	8	0-32	7	4	0-24	5
Herring Gull	2	0-4	7	1.5	0-2	5	0	0	0
Great Black-backed Gull	2	0-21	6	0	0-14	3	0	0	0

* SCI species.

n > 0 = the number of non-zero counts.

Table 14.Distribution of regularly occurring waterbird species between the sectors adjoining the development site during the 2015/16 low tide counts.

Species	Sector	15/09	29/09	08/10	29/10	23/11	10/12	08/01	27/01
Cormorant*	S3	0	0	0	0	1	0	0	0
	S4	0	0	0	0	1	0	0	0
	S5	2	0	1	4	10	0	0	0
	S6	0	3	1	3	2	0	0	0
Little Egret	S3	0	0	0	0	0	1	0	1
	S4	4	1	0	1	0	0	1	0
	S5	2	4	3	2	0	0	2	1
	S6	12	0	1	0	0	0	0	0
Grey Heron*	S3	1	0	0	1	1	1	0	0
	S4	1	0	0	0	1	2	1	0
	S5	1	0	2	2	1	0	1	0
	S6	2	0	5	3	0	1	0	1
Little Grebe	S3	0	0	0	3	0	2	2	1
	S4	0	0	0	0	5	3	2	1
	S5	0	0	0	0	0	0	3	0
	S6	0	0	0	0	0	1	0	0
Oystercatcher*	S4	4	3	7	6	0	2	0	2
	S5	16	6	21	17	8	9	0	8
	S6	0	0	1	0	0	0	0	0
Curlew*	S3	0	1	1	1	1	1	0	0
	S4	0	1	1	0	1	0	0	0
	S5	2	2	1	1	1	0	0	0
	S6	2	0	5	1	1	0	0	0

Species	Sector	15/09	29/09	08/10	29/10	23/11	10/12	08/01	27/01
Black-tailed Godwit*	S3	3	28	4	1	12	0	0	0
	S4	1	0	3	0	3	0	0	0
	S5	0	36	14	2	1	0	0	0
	S6	13	0	32	9	12	0	0	0
Greenshank	S3	0	0	0	1	0	1	0	2
	S4	1	1	1	0	0	1	0	0
	S5	0	1	2	1	2	1	0	1
	S6	1	0	3	0	0	0	1	0
Redshank*	S3	11	15	13	6	6	3	0	14
	S4	1	2	2	0	1	1	0	0
	S5	4	26	7	1	1	0	4	0
	S6	32	0	24	24	7	15	0	1
Black-headed Gull*	S3	9	2	6	12	18	18	11	12
	S4	6	4	2	1	1	12	0	0
	S5	7	2	2	1	37	1	1	0
	S6	16	1	312	105	4	13	0	30
Herring Gull	S3	0	0	1	2	0	1	2	0
	S4	2	0	0	0	0	0	0	0
	S5	0	1	1	2	0	0	0	2
	S6	0	1	1	0	0	0	0	0
Great Black-backed Gull	S3	1	0	1	1	0	0	0	0
	S4	3	0	0	1	0	1	0	0
	S5	4	2	0	6	0	1	0	0
	S6	1	0	5	13	0	0	0	2

* SCI species. On 08 Jan, 1 Little Egret, 1 Grey Heron, 2 Greenshank, 4 Redshank and 1 Black-headed Gull were also recorded in S3m; not included in the above totals.

Table 15.Distribution of regularly occurring waterbird species between the sectors adjoining the development site during the 2015/16 ebb/flood tide counts.

Name	Sector	15/09	29/09	08/10	29/10	23/11	10/12	08/01	27/01
Cormorant*	S4	0	0	0	0	1	0	0	0
	S5	0	0	1	0	0	1	0	0
Little Egret	S5	0	0	2	0	0	0	0	3
	S6	0	0	2	0	0	0	0	0
Grey Heron*	S4	0	0	0	1	0	0	0	0
	S5	0	1	0	2	1	0	0	0
	S6	0	0	2	1	2	1	0	0
Little Grebe*	S3	0	0	0	0	0	1	0	0
	S4	0	0	0	3	0	2	1	0
	S5	0	0	0	0	0	2	0	0
Oystercatcher*	S4	11	5	6	33	2	5	0	2
	S5	0	8	0	10	17	0	0	0
	S6	0	2	0	0	0	0	0	0
Curlew*	S3	0	1	0	1	0	0	0	0
	S4	0	0	0	1	0	0	0	0
	S5	0	1	1	2	0	0	0	0
	S6	0	0	0	1	0	0	0	0
Black-tailed Godwit*	S6	0	4	0	0	0	0	0	0

Name	Sector	15/09	29/09	08/10	29/10	23/11	10/12	08/01	27/01
Greenshank	S3	0	0	1	0	0	0	0	0
	S4	0	1	0	8	0	2	2	21
	S5	0	1	2	1	2	0	1	0
	S6	0	0	1	0	0	0	0	0
Redshank*	S3	2	6	3	2	0	2	0	0
	S4	0	4	0	3	1	2	10	0
	S5	1	2	3	14	3	10	2	0
	S6	3	32	1	0	0	1	0	0
Black-headed Gull*	S3	0	19	9	3	2	7	0	19
	S4	0	1	0	5	0	0	0	0
	S5	3	0	0	5	0	0	0	0
	S6	2	1	0	1	0	0	0	0
Herring Gull	S3	0	0	0	1	0	0	0	2
	S4	0	0	0	1	0	0	0	0
	S5	0	2	2	0	0	0	0	0
	S6	1	0	0	0	0	0	0	0
Great Black-backed Gull	S5	14	3	0	6	0	0	0	0

* SCI species. On 27 Jan, 13 Black-headed Gulls were also recorded in S3m; not included in the above totals.

Table 16. Distribution of regularly occurring waterbird species between the sectors adjoining the development site during the 2015/16 high tide counts.

Name	Sector	15/09	29/09	08/10	29/10	23/11	10/12	08/01	27/01
Cormorant*	S3	No count	1	0	0	0	No count	0	1
Little Egret	S5		1	0	1	2		0	0
	S6		0	0	1	0		0	0
Grey Heron*	S4		1	0	1	1		0	0
	S5		1	0	0	1		0	0
	S6		1	0	1	0		0	1
Little Grebe*	S3		0	0	2	0		1	1
	S4		0	0	0	1		2	0
Oystercatcher*	S3		5	3	9	0		0	5
	S4		2	0	0	15		0	0
Curlew*	S3		0	0	1	0		0	0
	S5		0	1	0	0		0	0
Greenshank	S3		2	4	13	0		0	0
	S4		0	2	0	3		0	0
	S5		0	2	0	1		0	0
	S6		1	0	2	0		0	0
Redshank*	S3		8	18	7	0		0	0
	S4		0	0	0	26		0	0
	S5		0	2	0	1		0	0
	S6		0	0	2	0		0	0

Name	Sector	15/09	29/09	08/10	29/10	23/11	10/12	08/01	27/01
Black-headed Gull*	S3		6	2	0	0		1	24
	S6		0	0	10	0		0	0

* SCI species.

Table 17.Relative importance of the sectors adjoining the development site.

	2009/10		2014/15					
	Ferrycarrig subsite		Ferrycarrig subsite		Sectors adjoining development site			
Species	mean	% of WB total	mean	non-zero counts	mean	qualifying counts	% of FC total	% of WB total
Cormorant	10	4%	23	8	3.5	6	19%	1%
Little Egret	4	10%	15	8	4.5	4	27%	3%
Grey Heron	3	12%	16	8	3.5	5	24%	3%
Little Grebe	0	0%	8	5	2.9	2	16%	0%
Oystercatcher	34	8%	81	8	13.8	8	16%	1%
Curlew	59	7%	81	8	3.0	8	3%	0%
Black-tailed Godwit	233	34%	1053	8	21.8	6	2%	1%
Greenshank	4	29%	10	8	2.6	3	18%	5%
Redshank	156	23%	181	8	27.6	8	15%	3%
Black-headed Gull	356	12%	778	8	80.8	8	10%	1%
Herring Gull	2	2%	9	7	2.0	5	21%	0%
Great Black-backed Gull	1	1%	19	8	5.3	4	32%	0%

Table 18.Comparison of waterbird importance (the percentage of the total Wexford Bay population) of various combinations of the sectors adjoining the development site.

Species	S4-S5	S3-S5	S3-S6
Cormorant	0.5%	0.5%	0.7%
Little Egret	1.8%	1.8%	2.7%
Grey Heron	1.2%	1.7%	2.9%
Little Grebe	0.0%	0.0%	0.0%
Oystercatcher	1.2%	1.2%	1.2%
Curlew	0.1%	0.1%	0.2%
Black-tailed Godwit	0.2%	0.4%	0.8%
Greenshank	2.2%	3.0%	5.1%
Redshank	0.8%	1.9%	3.3%
Black-headed Gull	0.2%	0.5%	1.2%
Herring Gull	0.2%	0.3%	0.3%
Great Black-backed Gull	0.2%	0.2%	0.4%

3.3. DISTURBANCE

3.3.1. Activities

The potentially disturbing shoreline activities recorded in the Ferrycarrig subsite during the 2015/16 counts are listed in Table 19. It should be noted that all the count days were weekdays and it is likely that higher levels of recreational activity occur at weekends. The development site is used as an informal recreation area, and people were observed walking in the site and/or along the eastern shoreline of the site on four of the eight count days. While some of these observations only refer to people seen in the interior of the site, it is likely that all the visitors to the site would walk to one, or more, of the shoreline areas. People walking the shoreline were also recorded in S1 (three count days) and S13 (five count days). Bait digging was recorded on the spit off the north-eastern corner of the development site on the one count day with spring low tide conditions when extensive intertidal sediment were exposed here. Bait digging was also recorded in S1 on two count days, with six people bait digging here on one of these days.

Boat activity was only recorded in the Ferrycarrig subsite on one of the eight count days during the 2015/16 counts: on 8th October the Aisling J was recorded crab potting, working an area in mid-channel from just upstream of the old bridge to opposite the mid-point of S13.

Table 19.Potentially disturbing shoreline activities recorded in the Ferrycarrig subsite during the 2014/15 counts.

Date	Time	Sector	Location	People	Dogs	Activity	Notes
15/09/2015	12:40	S4/S5	interior	1	1		
15/09/2015	15:30	S13	shoreline	2		walking shoreline	
29/09/2015	16:00	S5	shingle spit	2		bait digging	c. 50 m below shoreline; birds feeding close by
29/09/2015	16:30	S5	shoreline	1	1	walking shoreline from VP1	
08/10/2015	09:53	S13	shoreline	2	2	walking shoreline	
08/10/2015	16:32	S4/S5	interior	1			
08/10/2015	16:40	S4/S5	interior	2		entering site	
29/10/2015	16:19	S4/S5	interior	1	1	leaving site	
29/10/2015	16:19	S4/S5	interior	2		leaving site	
23/11/2015	09:59	S13	south end	1	1	walking shoreline	
10/12/2015	08:29	S13	southern end	1	1	walking shoreline	
10/12/2015	11:46	S1	mid and eastern sections	2	4	walking shoreline	walking along top of intertidal along section adjacent to road
10/12/2015	11:46	S1	western end	1		bait digging in intertidal	
08/01/2016	08:56	S3	northern end	1	1	walking along railway line	
08/01/2016	10:56	S1	mid	1	4	walking shoreline	walking along top of intertidal along section adjacent to road
08/01/2016	11:38	S13	mid	1	1	walking shoreline	
08/01/2016	17:15	S13	southern end	1	1	walking shoreline	only short section of shoreline accessible due to high tide
27/01/2016	08:54	S3/S4		1	1	walking shoreline	walked along shoreline of S4, and then along railway adjacent to S3
27/01/2016	14:35	S13	mid	2		walking shoreline	separate group from next record
27/01/2016	14:35	S13	mid	1		walking shoreline	separate group from previous record

Date	Time	Sector	Location	People	Dogs	Activity	Notes
27/01/2016	15:10	S1	western end	6		bait digging in intertidal	

Activities on public roads adjacent to the shoreline, and activities within the Wexford Harbour Boat and Tennis Club, were not recorded.

3.3.2. Disturbance responses

The following analyses are based on the response distance (RD) data recorded during the 2015/16 waterbird survey. The RD is the distance of the bird from the disturbance source when it showed a disturbance response; if the bird did not show a disturbance response the closest distance to which the bird was approached was recorded as the RD. I distinguish between direct RDs (the straight line distance from the disturbance source) and lateral RDs (the perpendicular distance from the route taken by the disturbance source). The lateral RD was only recorded when the disturbance source was walking the shoreline, and when there was extensive exposed intertidal habitat below the shoreline (i.e,. the lateral escape distance was not constrained by the intertidal width). The lateral RD can never exceed the direct RD, and is usually less than the direct ED (as the direct RD is the hypoteneuse, and the direct RD is the opposite side, of a right-angle triangle). Where birds show no response to the disturbance source the direct and lateral RDs are the same.

The most common disturbance response recorded was flushing. I did not record any birds using walking as method of escaping disturbance. Some birds showed a brief alert response before flushing, but I did not record any birds showing an alert response and then not flushing. As the RDs at which alert responses occurred did not differ significantly from the RDs at which the birds flushed (within the level of precision that was possible in estimating distances in the field), the following analyses are restricted to RDs of flush responses.

Across all species, the modal direct RD of birds flushed by walking along the shoreline was 50-75 m, and 85% of observations of birds flushing were at direct RDs of 150 m or less (Table 20). Although the data was limited, Curlew appeared to have relatively large direct RDs with all four observations at distances of more than 150 m. The only other species with a direct RD of more than 150 m recorded was Shelduck. This is in accordance with the general pattern of RDs being positively related to body size that has been reported from disturbance studies in the scientific literature (e.g., Laursen et al., 2005). Observations of lateral RDs were limited, but, apart from Shelduck and Curlew, all the observations were at RDs of 75 m or less (Table 21).

The RDs of birds flushed from shoreline vantage points (Table 22) are likely to underestimate typical RD values: in this situation the disturbance source suddenly appears at the vantage point and the birds may have been much closer to the vantage point than they would normally have tolerated for an approaching disturbance source. However, all the RDs recorded in this situation were 75 m or less.

Across all species, the modal direct RD at which birds showed no response was 100-150 m, while birds could tolerate approach to within 25-50 m (Table 23). On 29/09/2015, there were two bait diggers working off the shingle spit and there were 6 Oystercatcher and 36 Black-tailed Godwit feeding within 25-50 m, and 26 Redshank feeding within 50-75 m of the bait diggers. Similarly, these did not flush when I walked along the shoreline at similar distances from the birds.

Where the destination to which flushed birds moved was recorded, 63% of observations involved birds moving out of the sector (Table 24). These usually involved birds moving between the two sectors immediately adjacent to the development site (S4 and S5; Table 25). Movements of birds to the sectors to the east and west (S3 and S6) and across the estuary to the opposite shore (S13) were also recorded quite frequently. There were only two observations of more distant movements: a group of 7 Oystercatchers flushed from S5 and flew out of the Ferrycarrig subsite intop the main harbour (possibly to the roost on the stone jetty off Ferrybridge), and a flock of 13 Black-tailed Godwit flushed from S5 and moved to the northern end of the Ferrycarrig subsite.

Table 20.Direct response distances of birds experimentally flushed by walking along the shoreline.

Species	Number of observations at direct escape distances (m) of:							n
	0-25	25-50	50-75	75-100	100-150	150-200	200-300	
Shelduck	0	0	0	0	1	1	0	2
Little Egret	0	0	0	0	1	0	0	1
Grey Heron	0	2	0	0	0	0	0	2
Oystercatcher	0	4	2	1	1	0	0	8
Curlew	0	0	0	0	0	2	2	4
Black-tailed Godwit	1	0	1	0	0	0	0	2
Common Sandpiper	1	0	0	0	0	0	0	1
Greenshank	0	0	4	0	2	0	0	6
Redshank	0	2	4	2	1	0	0	9
Totals	2	8	11	3	6	3	2	35

Table 21.Lateral response distances of birds experimentally flushed by walking along the shoreline.

Species	Number of observations at lateral escape distances (m) of:							n
	0-25	25-50	50-75	75-100	100-150	150-200	200-300	
Shelduck	0	0	0	0	1	1	0	2
Grey Heron	1	0	0	0	0	0	0	1
Oystercatcher	3	0	0	0	0	0	0	3
Curlew	1	0	0	0	0	1	2	4
Black-tailed Godwit	0	0	1	0	0	0	0	1
Greenshank	1	1	0	0	0	0	0	2
Redshank	1	2	0	0	0	0	0	3

Table 22.Direct response distances of birds flushed from shoreline vantage points.

Species	Number of observations at direct escape distances (m) of:			n
	0-25	25-50	50-75	
Cormorant	0	1	0	1
Little Egret	1	0	0	1
Grey Heron	2	0	0	2
Oystercatcher	4	3	0	7
Black-tailed Godwit	1	1	0	2
Bar-tailed Godwit	1	0	0	1
Greenshank	1	0	1	2
Redshank	2	2	2	6
Great Black-backed Gull	1	0	0	1

Table 23.Direct response distances of birds showing no response to disturbance.

Species	Number of observations at direct distances (m) of:							n
	0-25	25-50	50-75	75-100	100-150	150-200	200-300	
Little Egret	0	1	0	0	1	0	0	2
Grey Heron	0	0	0	0	1	1	0	2
Oystercatcher	0	2	0	2	3	0	1	8
Curlew	0	0	0	0	1	0	0	1
Black-tailed Godwit	0	2	0	0	3	0	2	7
Greenshank	0	1	0	1	2	0	0	4

Species	Number of observations at direct distances (m) of:							n
	0-25	25-50	50-75	75-100	100-150	150-200	200-300	
Redshank	0	0	2	2	3	0	2	9
Black-headed Gull	0	0	0	0	3	1	2	6
Lesser Black-backed Gull	0	0	0	0	1	0	1	2
Totals	**0**	**6**	**2**	**5**	**18**	**2**	**8**	**41**

Table 24.Movement types of birds after being flushed.

Species	Number of observations of movements:			n
	within sector	outside sector	not recorded	
Shelduck	0	1	1	2
Cormorant	0	0	1	1
Little Egret	0	2	2	4
Grey Heron	1	4	1	6
Oystercatcher	4	13	1	18
Curlew	2	0	3	5
Black-tailed Godwit	2	1	1	4
Bar-tailed Godwit	0	0	1	1
Turnstone	0	1	0	1
Common Sandpiper	0	1	0	1
Greenshank	8	8	1	17
Redshank	8	11	0	19
Black-headed Gull	0	0	1	1
Great Black-backed Gull	0	0	2	2
Totals	25	42	15	82

Table 25.Movement destinations of birds after being flushed.

Species	Number of observations of movements:					n
	S4 to/from S5	S4 to S3	S5 to S6	to S13	distant	
Shelduck	1	0	0	0	0	1
Little Egret	1	0	1	0	0	2
Grey Heron	2	0	2	0	0	4
Oystercatcher	11	0	0	1	1	13
Black-tailed Godwit	0	0	0	0	1	1
Turnstone	0	0	0	1	0	1
Common Sandpiper	1	0	0	0	0	1
Greenshank	1	3	2	2	0	8
Redshank	3	4	2	2	0	11
Totals	20	7	7	6	2	42

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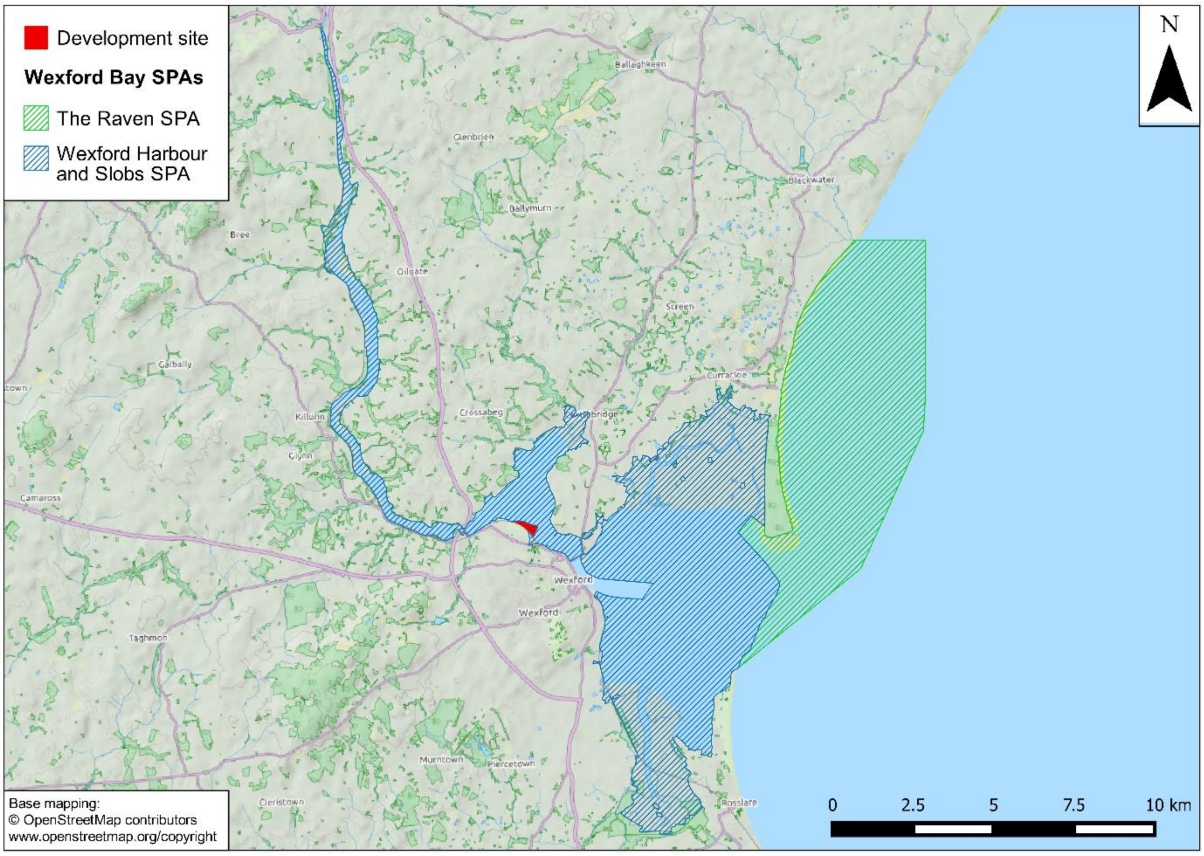


Figure 1. Wexford Bay SPAs.

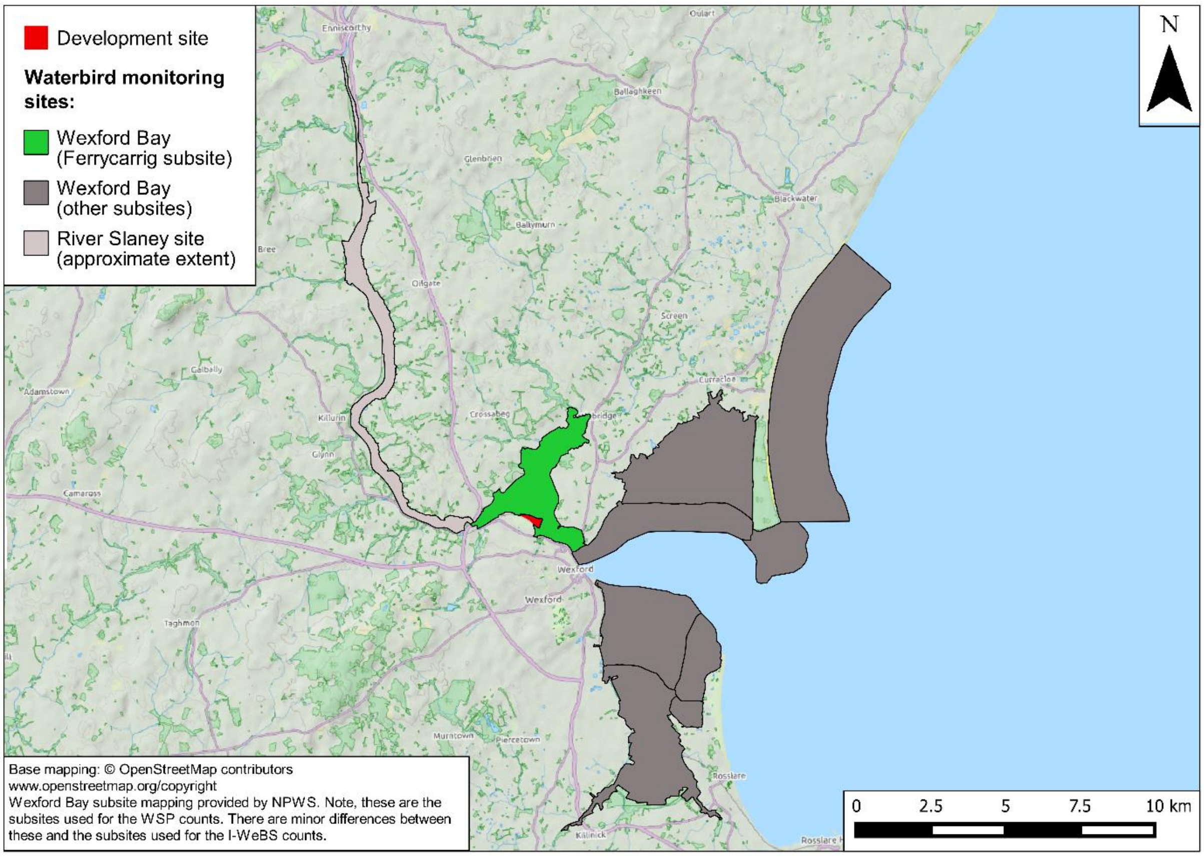


Figure 2. Waterbird monitoring sites used in Irish Wetland Bird Survey counts, and in the 2009/10 Waterbird Survey programme.

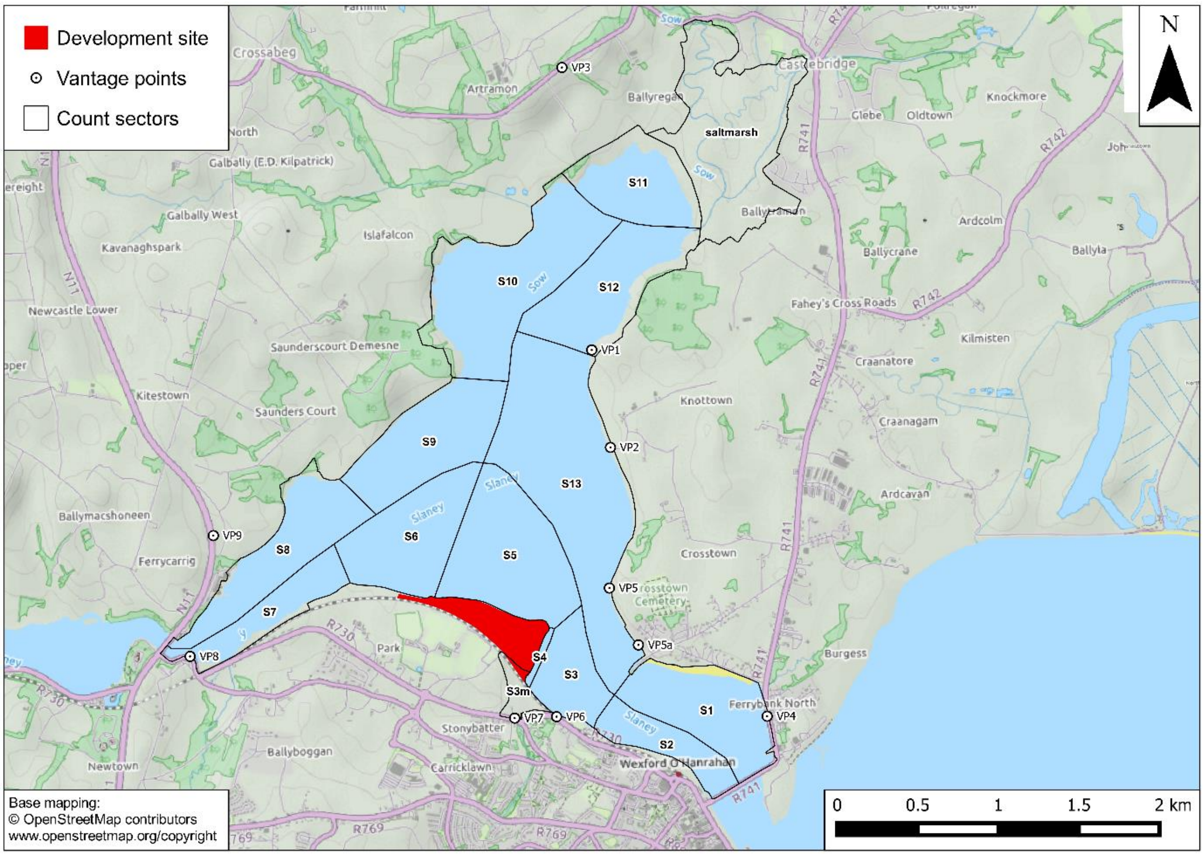


Figure 3. Vantage points and count sectors used for the 2015/16 waterbird counts.

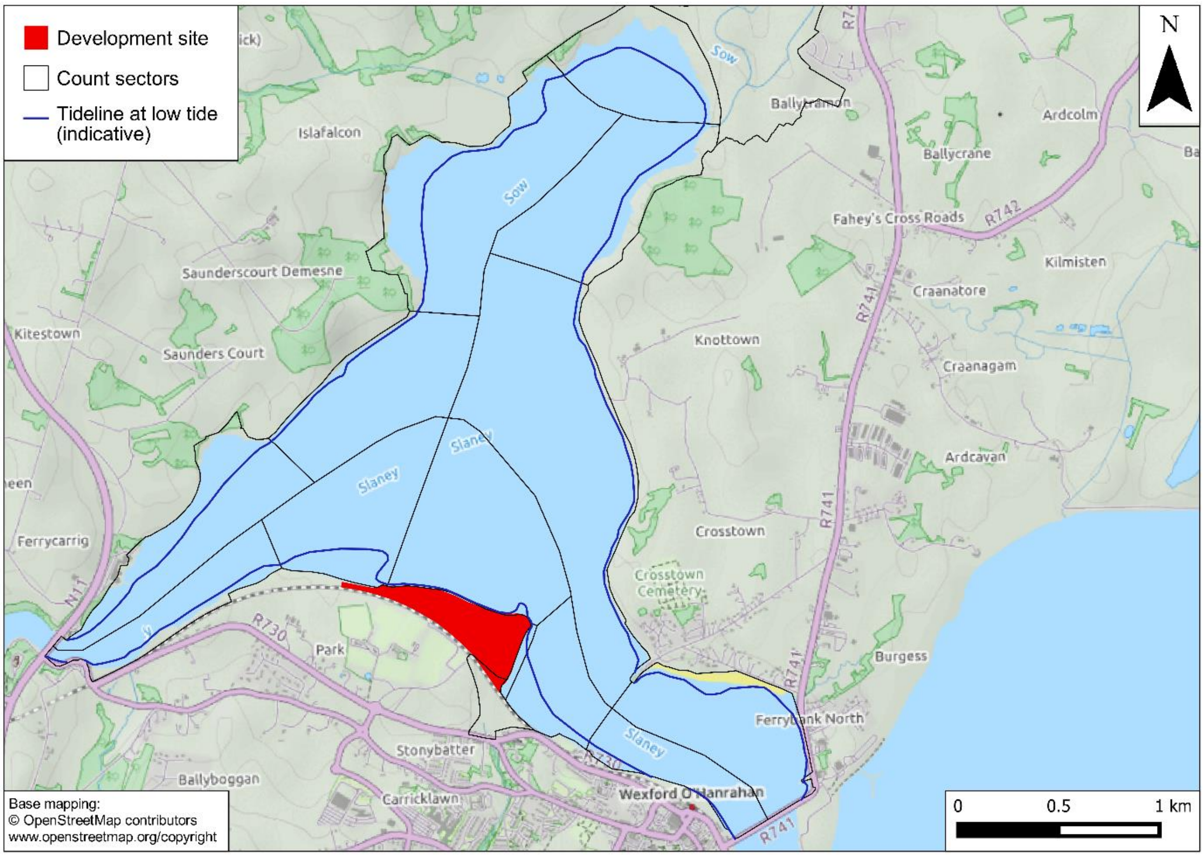


Figure 4. Typical extent of intertidal exposure at low tide.

Appendix 6.4 - Vascular plants recorded on or adjacent to site during field surveys

Scientific Name	Common name
Acer pseudoplatanus	Sycamore
Achillea millefolium	Yarrow
Agrostis capillaris	Common bent
Agrostis stolonifera	Creeping bent
Alopecurus pratensis	Meadow foxtail
Alnus glutinosa	Common alder
Anagallis arvensis	Scarlet Pimpernel
Angelica sylvestris	Wild angelica
Anthoxantum odoratum	Sweet vernal grass
Anthyllis vulneraria	Kidney vetch
Arrhenatherum elatius	False Oat-grass
Asplenium scolopendrium	Hart's tongue fern
Atriplex prostata	Spear-leaved orache
Beta vulgaris	Sea beet
Betula pendula	Silver birch
Betula pubescens	Downy birch
Blackstonia perfoliata	Yellow wort
Brachypodium sylvaticum	False brome
Buddleia davidii	Butterfly bush
Calystegia sepium	Hedge bindweed
Calystegia silvatica	Large bindweed
Carex otrubae	False fox sedge
Carex remota	Remote sedge
Centaurea nigra	Common Knapweed
Centaurium erythraea	Common centaury
Cerastium montanum	Common mouse-ear

Scientific Name	Common name
Chamerion angustifolium	Rosebay willowherb
Chenopodium rubrum	Red goosefoot
Cirsium arvense	Creeping thistle
Cirsium vulgare	Spear thistle
Clematis vitalba	Traveller's joy
Convolvulus arvensis	Field bindweed
Conyza canadensis	Bilbao's fleabane
Corylus avellana	Hazel
Crataegus monogyna	Hawthorn
Crepis capillaris	Smooth hawksbeard
Cyanosaurus cristatus	Crested dog's tail
Dactlylis glomerata	Cock's foot
Daucus carota	Wild carrot
Dryopteris dilatata	Broad buckler fern
Elymus athericus	Sea couch
Elymus repens	Common couch
Epilobium sp	Willoherb species
Equisetum arvense	Field horsetail
Equisetum fluviatile	Water horsetail
Equisetum telmateia	Great Horsetail
Euphorbia helioscopia	Sun spurge
Euphrasia offincinalis agg.	Eyebright
Fallopia japonica	Japanese knotweed
Festuca rubra	Red fescue
Filago vulgaris	Common cudweed
Fraxinus excelsior	Common Ash
Fumaria muralis	Common fumitory
Galium aparine	Cleavers

Scientific Name	Common name
Geranium dissectum	Cut-leaved cranesbill
Geranium robertianum	Herb robert
Glechoma hederacea	Ground ivy
Hedera helix	Common ivy
Heracleum sphondylium	Common hogweed
Holcus lanatus	Yorkshire fog
Hypochaeris radicata	Cat's ear
Ilex aquifolium	Holly
Juncus articulatus	Jointed rush
Juncus conglomeratus	Compact rush
Juncus effusus	Soft rush
Juncus inflexus	Hard rush
Juncus maritimus	Sea rush
Kickxia elatine	Sharp-leaved fluellen
Lathyrus pratensis	Meadow vetchling
Leucanthemum vulgare	Oxeye daisy
Leymus arenarius	Lyme grass
Linum bienne	Pale flax
Lotus corniculatus	Common bird's-foot trefoil
Lotus pedunculatus	Greater bird’s-foot trefoil
Luzula camprestris	Field wood rush
Lythrum salicaria	Purple loosestrife
Matricaria discoidea,	Pineapple weed
Medicago lupulina	Black medick
Odontites vernus	Red bartsia
Papaver dubium	Long-headed poppy
Persicaria maculosa	Redshank
Petasites fragrans	Winter Heliotrope

Scientific Name	Common name
Phalaris arundinacea	Reed canary grass
Phragmites australis	Common reed
Picris echioides	Bristly oxtongue
Plantago lanceoloata	Ribwort plantain
Plantago maritima	Sea plantain
Polystichum setiferum	Soft shield fern
Potentilla anserina	Silverweed
Prunella vulgaris	Self heal
Prunus spinosa	Blackthorn
Pteridium aquilinum	Bracken
Pulicaria dysenterica	Common fleabane
Quercus petraea	Sessile oak
Ranunculus acris	Meadow buttercup
Ranunculus repens	Creeping buttercup
Ranunculus scleratus	Celery-leaved Buttercup
Reseda luteola	Weld
Rosa canina	Dog rose
Rosa fruticosus agg.	Bramble
Rumex acetosa	Common sorrel
Rumex acetosella	Sheep sorrel
Salix cinerea	Grey willow
Salix sp.	Willow species
Sambucus niger	Elderberry
Scrophularia nodosa	Common figwort
Senecio jacobaea	Common ragwort
Silene uniflora	Sea campion
Solanum dulcamara	Biterweet nightshade
Sonchus asper	Prickly sow-thistle

Scientific Name	Common name
Sonchus oleraceus	Smooth sow-thistle
Sparganium erectum	Branched burr-reed
Spegula arvenesis	Corn spurrey
Stachys sylvatica	Hedge Woundwort
Stellaria graminea	Lesser stitchwort
Sueda maritima	Annual seablite
Taraxacum agg.	Dandelion
Trifolium dubium	Lesser trefoil
Trifolium pratense	Red clover
Trifolium repens	White clover
Tripleurospermum maritinum	Sea Mayweed
Tussilago farfara	Colt's foot
Typha latifolia	Common bulrush
Ulex europaeus	Gorse
Urtica doicia	Common nettle
Vicia cracca	Tufted vetch
Vicia sepium	Bush vetch
Vicia sativa	Common vetch
Viola sp	Dog violet species

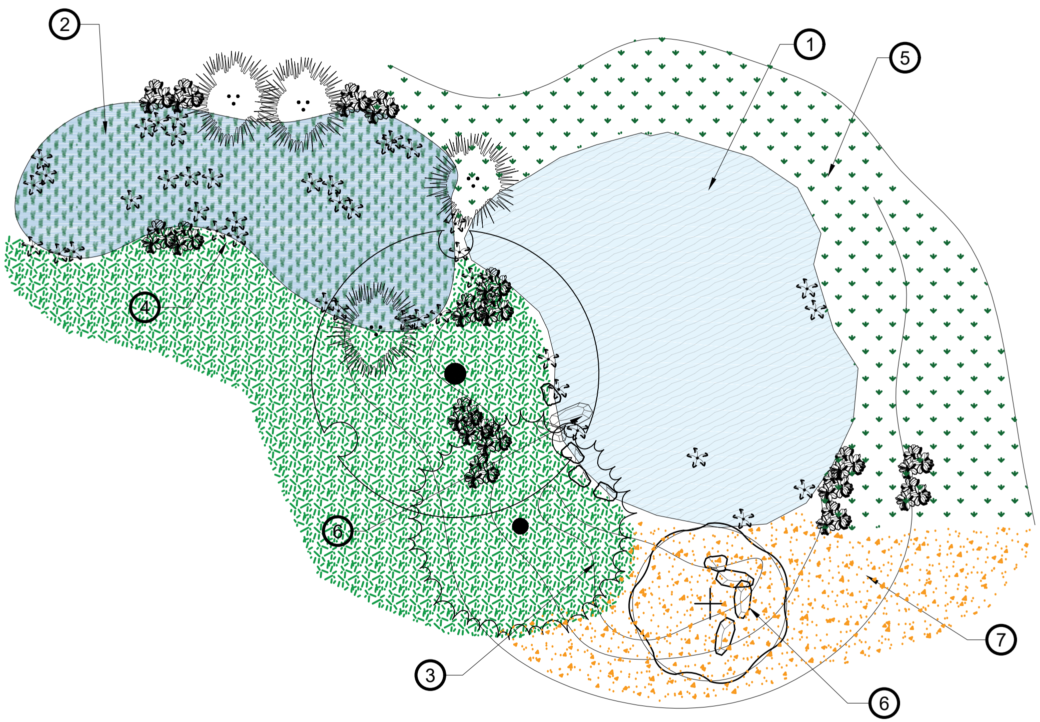
Appendix 6.5 - Bird species recorded within the development site

Table C1 lists all bird species recorded within the development site (i.e., excluding birds recorded on the shoreline and adjacent estuary) during the waterbird survey visits, and during the otter survey on 24/11/2015.

Table C1 Bird species recorded within the development site September 2015-January 2016.

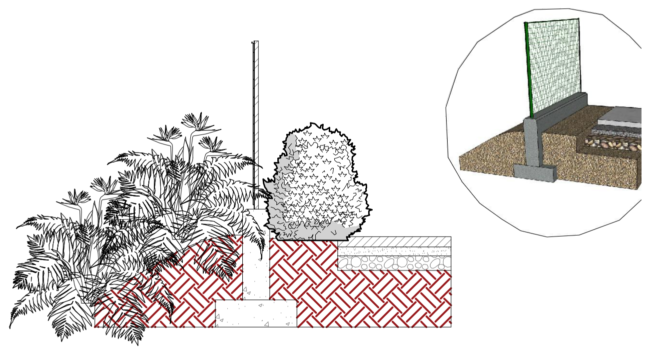
Species	BoCCI	15/09	29/09	09/10	29/10	23/11	24/11	10/12	08/01	27/01
Pheasant	-		□				□			
Sparrowhawk	Amber								□	
Buzzard	Green						□	□		
Snipe	Amber				□					□
Woodpigeon	Green	□	□	□				□	□	□
Short-eared Owl	Amber				□					
Kestrel	Amber	□	□							
Magpie	Green	□			□		□	□		
Jackdaw	Green		□				□		□	□
Rook	Green	□								
Hooded Crow	Green			□	□		□			
Goldcrest	Amber		□			□	□			
Blue Tit	Green	□	□		□	□	□			
Great Tit	Green		□		□					
Swallow	Amber	□								
Long-tailed Tit	Green			□			□			
Chiffchaff	Green		□				□			
Wren	Green	□	□	□	□	□	□	□		□
Blackbird	Green	□	□		□	□	□	□	□	□
Song Thrush	-	□	□		□	□	□	□		
Mistle Thrush	Amber		□					□		
Robin	Amber		□	□	□	□	□	□	□	□
Wheatear	Amber			□						
Dunnock	Green	□		□		□	□	□		
Pied Wagtail	Green	□			□					
Meadow Pipit	Red	□		□	□				□	
Chaffinch	Green	□	□	□	□	□	□		□	
Bullfinch	Green		□		□		□	□		□
Linnet	Amber						□			
Lesser Redpoll	Green						□			
Goldfinch	Green		□			□	□			
Reed Bunting	Green	□					□			

Appendix 6.6 Otter pond design



1 OTTER POND
2 MARGINAL WET LAND
3 ELEVATED EARTH AND GRAVEL EMBANKMENT
4 WETLAND PLANTING
5 MARGINAL GRASSES
6 ROCK OUT CROPS FOR BASKING
7 GRAVEL SLOPES

SUBJECT TO SITE CONDITIONS POND WILL BE CONSTRUCTED USING NATURAL CLAY / OR /MUD LINED.
IN THE EVENT THAT THE AREA DESIGNATED FOR A NATURAL POND CAPPING IS TOO PERMEABLE THAN THE OPTION TO USE A LINER IS PERCEIVED TO BE THE BEST METHOD OF CONSTRUCTION



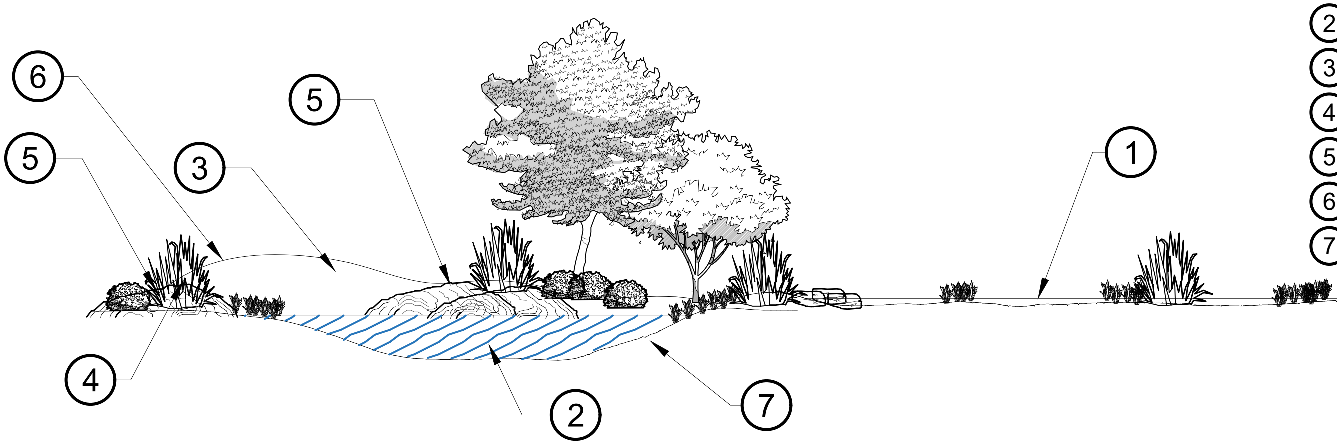
1 OTTER BOUNDARY FENCE

1:50 P-WA-(

3 OTTER POND

1:200

P-LA-PON-01



1 MARGINAL WETLAND
2 OTTER POND
3 ELEVATED BANKS
4 NATIVE PLANTING
5 ROCK OUTCROPS
6 GRAVEL BANKS
7 NATURAL POND MUD LINED SUBJECT TO ON SITE CONDITIONS.
~~OPTIONAL LINER~~ IF CONDITIONS ARE NOT CONCLUSIVE TO HOLDING FRESH WATER

4 OTTER POND SECTION

1:200

P-LA-PON-02

Appendix 6.7 Outline Habitat Management Plan

Carcur Park Outline Habitat Management Plan during and post construction					
Habitat	**Objective**	**Target**	**Method**	**Management**	**Evaluation**
Exposed sand/gravel (ED1) habitat	To recreate sparsely vegetated bare ground gravel habitat and south facing gravel/sand bank. To recreate habitat for common cudweed (*Filago vulgaris*) and pale flax (*Linum bienne*) and suitable nesting habitat for solitary bee species and other inveretebrates	Reoccurrence of common cudweed and pale flax on receptor site and other calcicolous plant species. Use of habitat by solitary bees	Protection of area from construction activities Baseline botanical survey (during May, June or July) to record the plant species diversity and the frequency of common cudweed and pale flax prior to excavation of soils. Excavation and saving of soils (gravel) Preparation of receptor site	Initial management 1-2 years Annual strimming of vegetation. Use of strimmings as green hay to further seed the habitat in initial years. Removal of green hay Annual strimming of areas with 3- year rotational pattern. (Leaving 1/3 of habitat uncut every year) Removal of cuttings when dry after seed drop to prevent enrichment of soil Scarification of soil if necessary to provide some level of disturbance to promote seed germination	Monitoring after 1, 3, and 5 years to record the number and diversity of floral species. Quantitative survey of frequency of common cudweed plants and pale flax. Comparison to baseline survey Assessment of appropriateness of management regime

Carcur Park Outline Habitat Management Plan during and post construction					
Habitat	**Objective**	**Target**	**Method**	**Management**	**Evaluation**
			Transfer of soils to receptor site[1]		
Pond	To recreate pond suitable for otter use	Confirmed use of pond by otter	Construct new pond prior to infilling of existing pond Monitor otter activity around new pond. Record sprainting activity around new pond and use of trail cameras to confirm use of pond	Monitor water levels Monitor re-vegetation of pond Monitor vegetation infilling of pond and clear out if necessary to maintain some open water with marginal vegetation	Confirm use of new pond by otter prior to infilling existing pond Monitoring of otter activity at pond and at boundary of site in general) following completion of each phase of the development for 3 years Monitoring involves recording of sprainting activity and use of trail cameras if necessary
Hedgerows and treelines	To protect retained trees and hedgerows	No significant damage to retained trees at boundary and hedgerow along	Construction method statement to include measures to protect treelines and hedgerows during site infilling and construction of the boundary wall	Site ecologist to monitor during construction phase	Monitor condition of hedgerows and trees

Carcur Park Outline Habitat Management Plan during and post construction					
Habitat	**Objective**	**Target**	**Method**	**Management**	**Evaluation**
Hedgerows and treelines	Offset tree loss by planting treelines, hedgerow and individual trees	Enhancement of treeline and hedgerows along boundary of development site	Landscape design provides for native hedgerow and treeline planting along boundary enhancement of hedgerow along rail line and planting of trees within amenity areas and roadsides.	After care management for 3 years. Replacement of any trees that fail. Once established hedgerows within development boundary will be cut once every 3 years on rotation (providing health and safety considerations allow) in winter outside the bird nesting season 1st March to 31st August incl.)	Monitor survival and condition of hedgerows/treelines
Invasive species	To eradicate knotweed and three-cornered leek on site	Eradication of knotweed. No spread or occurrence of knotweed within or outside the development site	Implementation of Invasive species management plan by specialist contractor	Monitoring of site to check for reoccurrence Carried out 6 – 8 weeks after excavations and again in April/May of following year)	Presence/absence confirmation

Carcur Park Outline Habitat Management Plan during and post construction					
Habitat	**Objective**	**Target**	**Method**	**Management**	**Evaluation**
Watercourses **Slaney estuary**	Protection of watercourses outside of development boundary from pollution or sedimentation	No pollution incidences	Implementation of construction management plan including construction site drainage plan, petrol interceptors, silt traps/ponds and pollution control measures	Cleaning and maintenance of silt traps Inspection of drainage water outflow for sediments/pollution	Construction site records

[1]Saving and transfer of soils shall follow best practice guidance including but not limited to guidance contained in:

Anderson P. (2003). Habitat translocation a best practice guide CIRIA C600

Box J. (2003) Critical Factors and Evaluation Criteria for Habitat Translocation. Journal of Environmental Planning and Management, 46(6), 839–856

CHAPTER 7 SOILS GEOLOGY AND WATER

7.0 Introduction

By Arthur Murphy B.E, M.Eng.Sc, Chartered Engineer.

Principal at Arthur Murphy & Co

QUALIFICATIONS
B.E.(Hons) Civil Engineering, University College Dublin
M.Eng.Sc. (Hydrology), University College Dublin

1974 to 1979	Employed as a design engineer with a firm of Consulting Engineers in B.C. Canada working on hydrological studies, traffic engineering, residential development design.
1979 to 1988	Employed by Wexford County as a design engineer on water and sewage projects and as the Council's environmental engineer.
1988 to 2020	Independent Consulting Engineer providing civil and structural design services on land development, hotel and office and apartment block projects

7.0.1 PROJECT DESCRIPTION

"A total of **413 residential units** consisting of 175 houses (12 four bedroom detached houses + Garages, 20 four bedroom Semi-Detached houses, 2 four bedroom corner detached houses, 80 three bedroom Semi Detached Houses, 20 three bedroom terraced houses, 7 three bed end of terrace houses, 4 three bedroom corner houses, 20 two bedroom terraced houses, 6 two bedroom end of terrace, 4 Semi-Detached houses), 7 apartment blocks with a total of 238 Apartments: (Block One: (47 units over 5 floors: 40 two bed, 7 three bed), Block Two: (50 units over 7 floors: 4 one bed, 38 two bed, 8 three bed), Block Three: (45 units over 7 floors: 3 one bed, 34 two bed, 8 three bed), Block Four: (20 units over 4 floors: 1 one bed, 19 two bed), Block Five: (38 units over 5 floors: 1 one bed, 37 two bed,) Block Six: (19 units over 4 floors: 3 one bed, 15 two bed, 1 four bed) Block Seven: (19 units over 4 floors: 3 one bed, 15 two bed, 1 four bed)). **Together with two crèche facilities** (Crèche A: 346.4 sqm floor area. Crèche B 395.3sq.m floor area) and a retail unit. A total of **767 Car parking spaces** (248 private parking spaces, 501 public spaces and 18 crèche spaces) and all associated site works".

The proposal shall be delivered over four phases of development. An EIAR (Environmental Impact Assessment Report), an NIAR (NATURA Impact Assessment Report) and a SSFRA (Site Specific Flood Risk Assessment have been prepared as part of the planning application.

7.0.2 ASPECTS COVERED IN THIS CHAPTER

This Chapter deals with the following aspects of the project

7.1 Soils and Geology
7.2 Water
7.3 Engineering Services and Gas Measures

7.1 SOILS AND GEOLOGY

By: Malcolm Fitzell B.A. (Mod), M.Sc., PGeo, Senior Geologist,
Apex Geoservices Ltd., Unit 6 Knockmullen Business Park, Gorey, Co. Wexford.

QUALIFICATIONS
B.A. Mod. (Hons) Geology,Trinity College Dublin
M.Sc. (Engineering), Trinity College Dublin

Specialisation Environmental and Engineering Geology
Over 20 years' geological experience including surveys and reporting for construction sites, quarries, route planning, initial site investigation to detailed assessments of site suitability for major road schemes and other geotechnical investigations throughout Ireland. Writing soils and geology sections of environmental impact statements. Groundwater and rock, sand and gravel aggregate resource investigation. Previous experience for over 10 years as geologist in base metals, gold and industrial minerals exploration in Ireland and overseas.

PROFESSIONAL MEMBERSHIP
Professional Geologist (P.Geo), Institute of Geologists of Ireland (IGI), Membership No. 249
EurGeol (Professional Member of the European Federation of Geologists)

7.1.1 INTRODUCTION AND METHODOLOGY

This section of the Environmental Impact Statement deals with the possible impacts on soils and geology which could arise from the proposed development by William Neville and Sons at Carcur Park, Wexford. The soils and geology assessment was prepared in accordance with the Guidelines on Environmental Impact Statements[1]and Geology in Environmental Impact Statements, a Guide.[2]

The soils and geology of the surrounding area are described based on the following methodology:

- Baseline Review of available regional-scale data for the area including the Teagasc soils map[3], the Geological Survey of Ireland Quaternary subsoils map[4], and the Geological Survey of Ireland bedrock geological map[5];

- Review of existing data from previous trial pits and cable percussion drilling carried out in 2007across the site;

- Site walkover across the site. The walkover was carried out by an Apex Geoservices Ltd geologist.

A check was made of the Geological Survey of Ireland 1:10560 scale (6 inch: 1 mile) archival field mapping sheets for the area which do not show any relevant soil or bedrock geological data for the site.

A check was made of the Geological Survey of Ireland geotechnical database for the area which did not show any records available for the vicinity of the site.

Previous mineral exploration records, available on Open File at the Geological Survey of Ireland, were checked but showed no relevant data for the site or the adjacent area.

Much of the ground on the site is overgrown with scrub and long grass, and/or has been disturbed by previous sand/gravel extraction.

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[1]Environmental Protection Agency (2002)Guidelines on the Information to be Contained in Environmental Impact Statements, Dublin.
[2] Institute of Geologists of Ireland (2013) Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements, Dublin.
[3]Teagasc Soil Map of Ireland available as Geological Survey of Ireland Shapefile.
[4] Geological Survey of Ireland Quaternary Subsoils Map of Irelandavailable as Geological Survey of Ireland Shapefile.
[5] Geological Survey of Ireland (1994) Geology of South Wexford, Sheet 23, Dublin.

7.1.2 THE PROPOSED DEVELOPMENT

The proposed development comprises a housing development across the site, together with access roads and other necessary infrastructure. The nature and extent of the proposed development is dealt with elsewhere in this EIS.

The development will require the levelling of the existing soil surface and excavation of soils where necessary for construction and provision of access roads.

Figure 7.1.1 View to east across disused sand & gravel workings on the Carcur Park site

7.1.3 THE RECEIVING ENVIRONMENT

7.1.3.1 SOILS

The topsoils in the area of Carcur Park are shown on the Environmental Protection Agency Geoportal environmental map[6] as mainly renzinas/lithosols and gleys, bordered by an area of acid brown earths/ brown podzolics to the south-west, and alluvium to the south-east.

[6]Environmental Protection Agency Geoportal (gis.epa.ie/Envision)

The subsoils in the area are shown on the Teagasc regional soils map and Geological Survey of Ireland Quaternary map as glaciofluvial limestone sands and gravels covering all but a narrow strip in the western part of the site, glacial till (boulder clay) derived mainly from Lower Palaeozoic slates, and alluvium in a small portion of the south-east of the site, see Figure 2.

A sand and gravel pit operated over a considerable portion of the site, it is understood until c.2010, and the remains of this are evident in the form of spoil heaps, remains of pit faces, and several ruined buildings and derelict plant (evident on the aerial photo of the area, Figure 3). Extraction would obviously have resulted in stripping of topsoil and a considerable reduction in the amount and thickness of original sand and gravel on this part of the site.

Previous trial pitting and cable percussion drilling[7]were carried out in 2007 across the site. 9 cable percussion boreholes were completed and 20 trial pits. This investigation indicated 0.2-0.5m topsoil (where present), 1.3-3.0m made ground (at 4 locations), 0-2.1m gravelly clay, and 0.7-9.5m sand and gravel underlain by up to 8.0m gravelly clay.

A buried, disused landfill is situated close to the site and methane monitoring has been put in place. This is discussed separately in this EIS. During the site walkover sporadic fly tips were noted.

7.1.3.2 BEDROCK

The Geological Survey of Ireland bedrock map of the area indicates that most of the site is underlain by the Ballysteen Formation with the Ballymartin Formation under a small area at the western tip of the site and the Shelmaliere Formation in the south-eastern part of the site.

The Ballysteen Formation of Lower Carboniferous age (Courceyan Stage) is described as dark muddy limestone and shale. In detail it comprisesirregularly bedded and nodular bedded argillaceous bioclastic limestones (wackestones and packstones), interbedded with fossiliferous calcareous shales.

The Ballymartin Formation, also of Lower Carboniferous age (Courceyan) underlies the Ballysteen Formation. It consists of limestone and dark grey calcareous shale (interbedded weakly nodular grey muddy bioclcastic limestones and dark grey calcareous shaly mudstones).

The Shelmaliere Formation is Cambrian in age and comprises massive white and purple quartzites interbedded with subordinate red, purple, buff and green slates and phyllites locally. The Shelmaliere Formation is interpreted as being separated from the Ballysteen Formation by faults.

7.1.3.3 PROTECTED SITES

SPECIAL AREAS OF CONSERVATION

The Slaney estuary, immediately north of the site, lies within the Slaney River Special Area of Conservation (SAC) and also the Wexford Harbour and Slobs Special Protection Area (SPA).

GEOLOGICAL HERITAGE SITES

The Geological Survey of Ireland have designated certain geological sites throughout the country as Geological Heritage Sites which are of special scientific importance.

The Geological Heritage section of the Geological Survey of Ireland Spatial Resources map viewer does not show any such sites on or in the immediate vicinity of the site.

[7]CRH Estates Ltd. (2007) Site Investigations, Readymix Plant at Park/Carcur, Wexford.

MINERAL LOCALITIES AND QUARRIES

The Geological Survey of Ireland online public data viewer series does not show any mineral localities or quarries in or near the site.

Previous mineral exploration records, available on Open File at the Geological Survey of Ireland, were checked but showed no relevant data for the site or the adjacent area.

7.1.4 PREDICTED IMPACTS

The proposed development would result in a significant decrease in the area of *in situ* soils at surface on the site owing to the necessary removal of topsoil to allow for construction. However a considerable amount of soil has already been removed or dislocated as a result of previous sand and gravel extraction. However, topsoil so removed would be re-used in landscaping of green areas of the development, so the net loss would be minimised, and a considerable amount of ground previously stripped would be reinstated with topsoil.

It is also proposed to import fill from other Wm Neville & Sons Ltd building projects in the vicinity of Wexford town and perhaps from other projects as well and there will be between 1 and 3m of fill brought onto the site. This will be clean inert soil with perhaps some rock. The importation of fill from external sources introduces a risk of possible soil contamination on site. The fill importation will comply with relevant environmental and planning regulations in this regard. Industry standard screening and monitoring will be carried out to ensure that non-inert or potentially contaminated material is not placed on site.

Generally, potential impacts to the underlying soil and geological environment could derive from accidental leakage of hydrocarbon fuels or oils from vehicles and/or machinery on site during construction. In addition, the spillage and inappropriate disposal of any potentially hazardous substances (for example fuels or oils) on site could adversely impact on the surrounding groundmass. Discarded equipment can also potentially contain materials which could lead to contamination of the underlying soil environment.

There are no known reports of soil contamination at the site. The presence of a buried, disused landfill nearby has been noted already. Possible groundwater contamination issues are covered in the Site Specific Flood Risk Assessment which accompanies this application.

There is the possibility of soil erosion through the generation of airborne dust during construction especially during periods of dry weather. However, the quantity of soil remaining has been already significantly reduced by previous sand and gravel extraction and it is anticipated that relatively little additional soil would be lost through this process.

During periods of heavy rain the washing away of clay and silt size sediment deriving from soil and subsoil disturbance or removal as construction progresses may potentially result in additional siltation in local surface water bodies, drainage ditches and streams which drain into the Slaney estuary.

Impacts on the soil and geological environment also affect the agricultural environment due to the removal of agricultural land and soils as a result of building construction. However there will be no additional impact in this regard as there is no existing agricultural land on site.

7.1.5 MITIGATION MEASURES

Increase in soil moisture content, saturation of soil and erosion due to overflow from drains will be avoided by the provision of an adequate amount of new drains where necessary, and by avoiding placing large amounts of wet soil into bunds or storage mounds during construction.

Accidental spillage of oil and chemicals during construction would be contained and cleaned up using materials and equipment stored on site near the point of use. In the event of contamination of soil due to a spillage spreading outside the storage annexe or occurring elsewhere any soil so contaminated will be removed for proper disposal off-site.

Redundant equipment and machinery used during construction would be removed from site and disposed of in an appropriate manner using legal, regulated waste disposal facilities.

Siltation in local surface water bodies, drainage ditches and streams can be avoided by the construction of temporary settlement ponds during construction and careful site surface water management.

Significant importation of fill is required as shown on Arthur Murphy & Co Engineering Drawings PL04, PL 05 and PL09. The imported fill will be from greenfield sites in the vicinity of Wexford town and will be clean and inert. It will comply with relevant environmental and planning regulations. Industry standard screening and monitoring will be carried out to ensure that non-inert or potentially contaminated material is not placed on site.

7.1.6 RESIDUAL IMPACTS

The residual impacts are those that would occur after the mitigation measures have taken effect. In the case of the Carcur Park development, no significant residual impacts in terms of the soils and geology environment would be expected.

There would be a cessation of the current situation where unauthorised access to the site can occur, and the present fly tipping activity would cease, leading to a positive residual impact in this regard.

Topsoil presently previously removed from the site would be re-used in landscaping of green areas of the development and an amount of ground previously stripped would be reinstated with topsoil.

The importation of inert soil and rock fill to site will result in a re-configuration of the site landscape.

7.2 WATER

IE Consulting - Carlow Office has prepared a Site Specific Flood Risk Assessment (SSFRA) and Hydrological Assessment of Sediment transport at and in the vicinity of a proposed residential development site at Carcur Park, Wexford.

The extract below contains their summary conclusions and recommendations and the principal recommendation is that the minimum finished floor level on the site should be 3.25m OD (Malin Head). This recommendation has been complied with and all floor levels proposed are at or above this level.

7.2.1 HYDROLOGY STUDY CONCLUSIONS & RECOMMENDATIONS

In consideration of the findings of this site specific flood risk assessment and analysis the following conclusions and recommendations are made in respect of the proposed development site:-

- *A Site Specific Flood Risk (SSFRA) assessment, appropriate to the type and scale of development proposed, and in accordance with 'The Planning System and Flood Risk Management Guidelines – DoEHLG-2009' has been undertaken.*
- *The area of the proposed site has been screened, scoped and assessed for flood risk in accordance with the above guidelines.*
- *The primary flood risk to the proposed site can be attributed to an extreme fluvial and/or tidal flood event in the River Slaney and Slaney Estuary located adjacent to the northern and eastern boundaries of the site.*
- *Based on the Final CFRAM fluvial mapping in the vicinity of the site, the 1% AEP (1 in 100 Year – Flood Zone 'A') and 0.1% AEP (1 in 1000 year – Flood Zone 'B') extreme flood levels in the River Slaney in the vicinity of the proposed development site are predicted as 1.34 m OD (Malin) for both the 1% and 0.1% AEP events respectively.*
- *Based on the Irish Coastal Protection Strategy Study mapping in the vicinity of the site, the 0.5% AEP (1 in 200 Year – Flood Zone 'A') and 0.1% AEP (1 in 1000 year – Flood Zone 'B') extreme tidal flood levels in the River Slaney in the vicinity of the proposed development site are predicted as 1.76 m OD (Malin) and 1.95 m OD (Malin) for the Current Scenario and 2.76 m OD (Malin) and 2.95 m OD (Malin) for the High End Future Scenario respectively. The 2.95m OD (Malin) 1 in 1000 year return period for the High End Future Scenario has been adopted and all houses are at least 300mm above this level.*

- *A detailed Digital Terrain Model (DTM) has been developed for the area of the proposed development site. Utilising the DTM the predicted extreme fluvial and tidal flood extents have been delineated over the full extent of the proposed development site.*
- *In consideration of the findings of this Site Specific Flood Risk Assessment, and in the context of 'The Planning System & Flood Risk Management Guidelines – 2009' areas of the proposed development site fall within Flood Zone 'A' and Flood Zone 'B'.*
- *It is proposed to raise the existing ground levels within the site area to a minimum level of 2.95m OD, which is equal to the predicted 1 in 1000 year (0.1% AEP) High End Future Scenario tidal flood level in the vicinity of the site. This level of 2.95m OD is 1m above the 1 in 1000 year tidal flood level for the Current Scenario.*
- *It is recommended that the finished floor levels are constructed a minimum of 0.3m above the predicted 1 in 1000 year tidal flood level (0.1% AEP) for the High End Future Scenario, i.e. 2.95 + 0.3m = 3.25m OD (Malin).*
- *It is recommended that any existing or proposed surface water pipes or culverts within the site boundary are fitted with appropriately designed tidal flap valves.*
- *In consideration of the Current Scenario, the volume of tidal flood waters that may be displaced by the proposed development site are negligible in consideration of the occurrence of an extreme 0.5% AEP or 0.1% AEP tidal flood event in the Slaney Estuary. Displacement of these negligible volumes of flood waters from the area of the proposed development site would simply be attenuated within the vast volume of flood waters within the Slaney Estuary and would have an imperceptible impact on the hydrological regime of the area.*
- *In consideration of the predicted 0.1% AEP flow rate in the River Slaney in the vicinity of the site the volume of fluvial flood waters that may be displaced by the proposed development site are negligible in consideration of the occurrence of an extreme 1 % AEP or 0.1% AEP fluvial flood event in the River Slaney. Displacement of these negligible volumes of flood waters from the area of the proposed development site would simply be attenuated within the vast volume of flood waters within the River Slaney and would have an imperceptible impact on the hydrological regime of the area.*
- *The proposed surface water management system shall attenuate surface water runoff from the development to Greenfield Runoff rates in accordance with the GDSDS and shall not result in any displacement of flood waters in the area. As such there will be no increase in runoff from the site beyond the 'greenfield' runoff rate and*

therefore the development as proposed will not pose an increased flood risk to the area.

- *As discussed in Section 9 of the Site Specific Flood Risk (SSFRA) Assessment, development of the site is therefore not expected to have an adverse impact on the existing hydro-morphological regime of the Slaney Estuary.*

- *In consideration of the assessment and analysis undertaken as part of this Site Specific Flood Risk Assessment, overall development of the site is not expected to result in an adverse impact to the hydrological regime of the area and is not expected to adversely impact on adjacent lands or properties.*

7.3 ENGINEERING SERVICES AND GAS MEASURES

7.3.1 STORM WATER SYSTEM.

Wexford County Council requires attenuation facilities for all storm water, up to the 100 year design storm, before discharge to Wexford Harbour/Estuary. A standard storm water collection system is proposed with 5 attenuation storage facilities designed to this requirement. The permitted discharge is calculated based on the recommendations of the Greater Dublin Strategic Drainage Study.

The discharge will be controlled by a “Hydrobrake” or other approved control. The discharge pipes, fitted with a tidal flap, discharge to the estuary and are buried under the shore to below the low tide mark. Each attenuation facility is preceded by an oil/petrol interceptor and a silt trap manhole 1.8m diameter with a 1m deep sump.

(See also the following in the Engineering Report submitted with this application:

1. *Appendix A – Storm water report*

   which gives design information and

2. *Appendix B – Aquaculture Impact Report*

   which reviews the possibility of impact of the storm water on aquaculture in the estuary.)

7.3.2 WASTE WATER

The foul sewage from the development is to be pumped to the Wexford town and environs sewage system. Twin force mains 80mm and 150mm diameter have already been installed, in 2010, with the agreement of Wexford Council for this purpose along the access road to the proposed railway bridge site. The 80mm pipe is to be used initially to avoid septic conditions arising in the force main. As the site is developed further the 150mm pipe will be used. Irish water has agreed to the installation of 12 hours emergency storage at the pump station together with a facility for backup power generation. All elements are to be designed to recently issued Irish Water details and specifications.

A fully detailed set of proposals for the wastewater system, including a detailed pump station design have been submitted to and been accepted by Irish Water.

Irish Water have issued a Statement of Design Acceptance for the water and wastewater. A copy of this is contained in the Engineering Report.

The on-site pump station is located above the 1 in 1000 year flood level based on the High End Scenario of the OPW report taking into account 1m of sea level rise in the next 100 years.

For the sake of clarity, please note that Irish Water's reference to the need to increase the pump capacity at Carcur pump station refers to Irish Water's own pump station and not to the proposed on site pump station.

7.3.3 WATER SUPPLY

Water for the development is to be provided from the Wexford town public water supply and a supply main has already been installed with the agreement of Wexford County Council along the access road to the proposed railway bridge site. Water supply infrastructure will be constructed to Irish Water's specifications and details.

7.3.4 POSSIBLE GAS MIGRATION FROM CARCUR LANDFILL SITE.

(See also separate report in Appendix D of the Engineering Report submitted with this application, entitled "*Report on Management, Future Monitoring and Mitigation of Gas Emissions from Carcur Landfill Site".)*

7.3.4.1 LANDFILL LOCATION AND HISTORY

A land fill site was operated at Carcur south of the railway and largely east of the proposed development site during the mid-twentieth century. The landfill was closed in 1985, 33 years ago now. The closest edge of waste placement in the landfill is 130 metres away from the nearest proposed housing within the development. The development is separated from the landfill by the railway line and by tidal marshes on each side of the railway. This level of separation and the fine and waterlogged nature of the silts in the tidal zone almost certainly prevent gas from the landfill from reaching any dwellings in the proposed development.

7.3.4.2 MONITORING OF GAS LEVELS

Wexford County Council is monitoring the gas levels within the landfill site. As part of the preparation of this planning application 2 gas monitoring wells have been installed by the developer within the development site adjacent to the landfill to assist in determining whether there is any migration of gases under the railway and the intervening mudflats. The positions of the monitoring wells were agreed with Wexford Council and are shown on Arthur Murphy & Co's Drawing PL 01.

An initial set of readings indicated the presence of low levels of methane were present (0.3 to 0.4%). These levels are almost certainly background levels rather than indicating migration from the landfill site. This is as might be expected as there is more than 120 metres of saturated estuarine silt between the landfill and the test hole locations. This acts as a barrier to horizontal gas migration into the development site.

The Dept. of Environments 'Protection of New Buildings and Occupants from Landfill Gas', published in 1999 recommends that sites within 250m of landfill sites that were used within the last 30 years should be assessed for landfill gas. The Carcur landfill was closed in 1985, 35 years ago, and before any houses are occupied further time will have elapsed.

Nevertheless, it is proposed to continue monitoring the gas levels before, during and after construction to ensure that this conclusion is valid and that there is no unforeseen risk to the development. The results from this further monitoring will determine whether there is a need to take specific measures to protect housing within the development and the nature and extent of any measures that may be advisable.

7.3.4.3 REMEDIAL MEASURES

Should monitoring indicate that gas migration is occurring it is proposed to finalise the measures to be employed and their areal extent in conjunction with the County Council, and to their final approval, before construction commences on site.

This approach has been agreed with Wexford Council.

The measures and their extent will be based on the Council's findings and the further monitoring for landfill gas within the proposed development site.A range of protection measures are outlined in Dept. of Environments 'Protection of New Buildings and Occupants from Landfill Gas', published in 1999. The measures to be adopted will comply appropriately with these.

An additional measure that can be considered would be to install an open textured rock filled trench at an agreed location and to an agreed extent to act as a cut-off trench. In view of the existence of the silt barrier mentioned above this trench is not likely to be required but is available as an option should the need arise.

In addition the standard radon barrier in dwellings may be upgraded and the buildings underlain with 200mm of granular fill vented to the open air for houses in any part of the site deemed to be at risk. The areal extent of the site requiring protection will also be agreed with Wexford County Council.

7.3.4.4 RESIDUAL IMPACT

The development will have no impact on the landfill and more importantly gas migration from the landfill site is not expected to occur and should gas migration be detected the implementation of the measures set out in the Department of Environment's "Protection of new buildings and occupants from landfill gas" will ensure that there will be no impact on the buildings and occupants of the development.

8 Air Quality & Climate

8.1 INTRODUCTION AND METHODOLOGY

AWN Consulting Limited were commissioned to conduct an assessment into the likely air quality and climate impacts associated with the proposed residential development of 175 Houses and 238 Apartmentsin Carcur Park, Co. Wexford.

This chapter was completed by Dr. Avril Challoner. A Senior Air Quality Consultant at AWN Consulting who holds a First Class Honours Degree in Environmental Engineering from National University of Ireland, Galway (2009), as well as a PhD in Air Quality from the Trinity College Dublin (2012). Sheam a full member of both the Institute of Air Quality Management and Institution of Environmental Sciences. Avril has been active in the field of air quality and climate for 9 years, both in research and consultancy.

8.1.1 Ambient Air Quality Standards

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

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011, which incorporate European Commission Directive 2008/50/EC which has set limit values for the pollutants SO_2, NO_2, PM_{10}, benzene and CO (see Table 8.1) Council Directive 2008/50/EC combines the previous Air Quality Framework Directive (96/62/EC) and its subsequent daughter directives (including 1999/30/EC and 2000/69/EC). Provisions were also made for the inclusion of new ambient limit values relating to $PM_{2.5}$.

Table 8.1 *Air Quality Standards Regulations 2011 (based on EU Council Directive 2008/50/EC)*

Pollutant	Regulation Note 1	Limit Type	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 $\mu g/m^3$ NO_2
		Annual limit for protection of human health	40 $\mu g/m^3$ NO_2
		Critical limit for protection of vegetation	30 $\mu g/m^3$ NO + NO_2
Lead	2008/50/EC	Annual limit for protection of human health	0.5 $\mu g/m^3$

Pollutant	Regulation Note 1	Limit Type	Value
Sulphur dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	350 μg/m^3
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	125 μg/m^3
		Critical limit for the protection of vegetation	20 μg/m^3
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 μg/m^3 PM_{10}
		Annual limit for protection of human health	40 μg/m^3 PM_{10}
$PM_{2.5}$	2008/50/EC	Annual limit for protection of human health	25 μg/m^3 $PM_{2.5}$
Benzene	2008/50/EC	Annual limit for protection of human health	5 μg/m^3
Carbon Monoxide	2008/50/EC	8-hour limit (on a rolling basis) for protection of human health	10 mg/m^3 (8.6 ppm)

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

8.1.2 Climate Agreements

The UNFCCC is continuing detailed negotiations in relation to GHGs reductions and in relation to technical issues such as Emission Trading and burden sharing. The most recent Conference of the Parties to the Convention (COP23) took place in Bonn, Germany from the 6th to the 17th of November 2017 and focussed on advancing the implementation of the Paris Agreement. The Paris Agreement was established at COP21 in Paris in 2015 and is an important milestone in terms of international climate change agreements. The “Paris Agreement”, agreed by 200 nations, has a stated aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to greenhouse gas emissions will be based on Intended Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress has also been made on elevating adaption onto the same level as action to cut and curb emissions.

The EU, on the 23/24th of October 2014, agreed the “*2030 Climate and Energy Policy Framework*” (EU, 2014). The European Council endorsed a binding EU target of at least a 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990. The target will be delivered collectively by the EU in the most cost-effective manner possible, with the reductions in the ETS and non-ETS sectors amounting to 43% and 30% by 2030 compared to 2005, respectively.

Secondly, it was agreed that all Member States will participate in this effort, balancing considerations of fairness and solidarity. The policy also outlines, under "Renewables and Energy Efficiency", an EU binding target of at least 27% for the share of renewable energy consumed in the EU in 2030.

8.1.3 Gothenburg Protocol

In 1999, Ireland signed the Gothenburg Protocol to the 1979 UN Convention on Long Range Transboundary Air Pollution. The initial objective of the Protocol was to control and reduce emissions of Sulphur Dioxide (SO_2), Nitrogen Oxides (NO_X), Volatile Organic Compounds (VOCs) and Ammonia (NH_3). To achieve the initial targets Ireland was obliged, by 2010, to meet national emission ceilings of 42 kt for SO_2 (67% below 2001 levels), 65 kt for NO_X (52% reduction), 55 kt for VOCs (37% reduction) and 116 kt for NH_3 (6% reduction). In 2012, the Gothenburg Protocol was revised to include national emission reduction commitments for the main air pollutants to be achieved in 2020 and beyond and to include emission reduction commitments for $PM_{2.5}$. In relation to Ireland, 2020 emission targets are 25 kt for SO_2 (65% on 2005 levels), 65 kt for NO_X (49% reduction on 2005 levels), 43 kt for VOCs (25% reduction on 2005 levels), 108 kt for NH_3 (1% reduction on 2005 levels) and 10 kt for $PM_{2.5}$ (18% reduction on 2005 levels).

European Commission Directive 2001/81/EC, the National Emissions Ceiling Directive (NECD) (2014), prescribes the same emission limits as the 1999 Gothenburg Protocol. A National Programme for the progressive reduction of emissions of these four transboundary pollutants has been in place since April 2005 (DEHLG, 2007a; 2004). Data available from the EU in 2010 indicated that Ireland complied with the emissions ceilings for SO_2, VOCs and NH_3 but failed to comply with the ceiling for NO_X (EEA, 2012). Directive (EU) 2016/2284 "*On the Reduction of National Emissions of Certain Atmospheric Pollutants and Amending Directive 2003/35/EC and Repealing Directive 2001/81/EC*" was published in December 2016. The Directive will apply the 2010 NECD limits until 2020 and establish new national emission reduction commitments which will be applicable from 2020 and 2030 for SO_2, NO_X, NMVOC, NH_3, $PM_{2.5}$ and CH_4. In relation to Ireland, 2020-29 emission targets are for SO_2 (65% below 2005 levels), for NO_X (49% reduction), for VOCs (25% reduction), for NH_3 (1% reduction) and for $PM_{2.5}$ (18% reduction). In relation to 2030, Ireland's emission targets are for SO_2 (85% below 2005 levels), for NO_X (69% reduction), for VOCs (32% reduction), for NH_3 (5% reduction) and for $PM_{2.5}$ (41% reduction).

8.2 METHODOLOGY

8.2.1 Local Air Quality Assessment

The air quality assessment was carried out following procedures described in the publications by the EPA (EPA 2002, 2003, 2015, 2017) and using the methodology outlined in the policy and technical guidance notes, LAQM.PG(16) and LAQM.TG(16), issued by UK Department for Environment, Food and Rural Affairs (UK DEFRA 2001, 2016a, 2016b; UK Department of the Environment, Transport and Roads 1998, UK Highways Agency 2007). The assessment of air quality is carried out using a phased approach as recommended by the UK Department for Environment, Food and Rural Affairs (UK DEFRA 2016a). The phased approach recommends that the complexity of an air quality assessment be consistent with the risk of failing to achieve the air quality standards. In the current assessment, an initial scoping of key pollutants will be carried out at sensitive receptors. These sensitive receptors have the potential to have an impact on the concentration of key pollutants due to the proposed development. An examination of recent EPA and Local Authority data in Ireland (EPA 2018, 2017), has indicated that SO_2 and smoke and CO are unlikely to be exceeded at locations such as the current one and thus these pollutants do not require detailed monitoring or assessment to be carried out. However, the analysis did indicate potential problems in regards to nitrogen dioxide (NO_2) and PM_{10} at busy junctions in urban centres (EPA 2018, 2017). Benzene, although previously reported at quite high levels in urban centres (EPA 2018, 2017), has recently been measured at several city centre locations to be well below the EU limit value (EPA 2018, 2017). Historically, CO levels in urban areas were a cause for concern. However, CO concentrations have decreased significantly over the past number of years and are now measured to be well below the limits even in urban centres (EPA 2018, 2017). The key pollutants reviewed in the assessments are NO_2, PM_{10}, $PM_{2.5,}$ benzene and CO, with particular focus on NO_2 and PM_{10}.

Key pollutant concentrations were predicted for nearby sensitive receptors for the following five scenarios:

- The Existing scenario (2016), for model verification;
- Opening Year Do-Nothing scenario (DN), which assumes the retention of present site usage with no development in place (2020);
- Opening Year Do-Something scenario (DS), which assumes the proposed development in place (2020);
- Design Year Do-Nothing scenario (DN), which assumes the retention of present site usage with no development in place (2035) and
- Design Year of the Do-Something scenario (DS), which assumes the proposed development in place (2035).

The assessment methodology involved air dispersion modelling using the UK Design Manual for Roads and Bridges Screening Model (UK Highways Agency 2007) (Version 1.03c, July 2007), the NO_x to NO_2 Conversion Spreadsheet (UK Department for Environment, Food and Rural Affairs, 2014) (Version 5.1), and following guidance issued by Transport Infrastructure Ireland (TII 2011), UK Highways Agency (UK Highways Agency 2007), UK Department for Environment, Food and Rural Affairs (UK DEFRA 2016a) and the EPA (EPA 2002, 2003, 2015, 2017).

Transport Infrastructure Ireland guidance states that the assessment must progress to detailed modelling if:

- Concentrations exceed 90% of the air quality limit values when assessed by the screening method; or
- sensitive receptors exist within 50m of a complex road layout (e.g. grade separated junctions, hills etc).

The UK Design Manual for Roads and Bridgesguidance (UK Highways Agency 2007), on which Transport Infrastructure Ireland guidance was based, 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 the local air quality assessment:

- Road alignment change of 5 metres or more;
- Daily traffic flow changes by 1,000 AADT or more;
- HGVs flows change by 200 vehicles per day or more;
- Daily average speed changes by 10 km/h or more; or
- Peak hour speed changes by 20 km/h or more.

Concentrations of key pollutants are calculated at sensitive receptors which have the potential to be affected by the proposed development. For road links which are deemed to be affected by the proposed development and within 200 m of the chosen sensitive receptors inputs to the air dispersion model consist of; road layouts, receptor locations, annual average daily traffic movements (AADT), percentage heavy goods vehicles, annual average traffic speeds and background concentrations. The UK Design Manual for Roads and Bridges guidance states that road links at a distance of greater than 200 m from a sensitive receptor will not influence pollutant concentrations at the receptor. Using this input data the model predicts the road traffic contribution to ambient ground level concentrations at the worst-case sensitive receptors using generic meteorological data. The Design Manual for Roads and Bridges model uses conservative emission factors, the formulae for which are outlined in the Design Manual for Roads and Bridges Volume 11 Section 3 Part 1 – HA 207/07 Annexes B3 and B4. These worst-case road contributions are then added to the existing background concentrations to give the worst-case predicted ambient concentrations. The worst-case predicted ambient concentrations are then compared with the relevant ambient air quality standards to assess the compliance of the proposed development with these ambient air quality standards. Transport Infrastructure Ireland Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (TII 2011) detail a methodology for determining air quality impact significance criteria for road schemes and can be applied to any development that experiences a change in traffic values. The degree of impact is determined based on both the absolute and relative impact of the Proposed Scheme. Transport Infrastructure Ireland significance criteria have been adopted for the proposed developmentand are detailed in Table 8.2 to Table 8.4. The significance criteria are based on PM_{10} and NO_2 as these pollutants are most likely to exceed the annual mean limit values (40 µg/m^3). However, the criteria have also been applied to the predicted 8-hour CO, annual benzene and annual $PM_{2.5}$ concentrations for the purpose of this assessment.

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

Magnitude of Change	Annual Mean NO_2 / PM_{10}	No. days with PM_{10} concentration > 50 µg/m^3	Annual Mean $PM_{2.5}$
Large	Increase / decrease ≥ 4 µg/m^3	Increase / decrease >4 days	Increase / decrease ≥ 2.5 µg/m^3
Medium	Increase / decrease 2 - < 4 µg/m^3	Increase / decrease 3 or 4 days	Increase / decrease 1.25 - <2.5 µg/m^3
Small	Increase / decrease 0.4 - < 2 µg/m^3	Increase / decrease 1 or 2 days	Increase / decrease 0.25 - <1.25 µg/m^3
Imperceptible	Increase / decrease < 0.4 µg/m^3	Increase / decrease <1 day	Increase / decrease < 0.25 µg/m^3

Source: Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes - Transport Infrastructure Ireland (2011)

Table 8.3: Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration		
	Small	**Moderate**	**Large**
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥40 μg/m^3 of NO_2 or PM_{10}) (≥25 μg/m^3 of $PM_{2.5}$)	Slight adverse	Moderate adverse	Substantial adverse
Just Below Objective/Limit Value With Scheme (36 - <40 μg/m^3 of NO_2 or PM_{10}) (22.5 - <25 μg/m^3 of $PM_{2.5}$)	Slight adverse	Moderate adverse	Moderate adverse
Below Objective/Limit Value With Scheme (30 - <36 μg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 μg/m^3 of $PM_{2.5}$)	Negligible	Slight adverse	Slight adverse
Well Below Objective/Limit Value With Scheme (<30 μg/m^3 of NO_2 or PM_{10}) (<18.75 μg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥40 μg/m^3 of NO_2 or PM_{10}) (≥25 μg/m^3 of $PM_{2.5}$)	Slight beneficial	Moderate beneficial	Substantial beneficial
Just Below Objective/Limit Value With Scheme (36 - <40 μg/m^3 of NO_2 or PM_{10}) (22.5 - <25 μg/m^3 of $PM_{2.5}$)	Slight beneficial	Moderate beneficial	Moderate beneficial
Below Objective/Limit Value With Scheme (30 - <36 μg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 μg/m^3 of $PM_{2.5}$)	Negligible	Slight beneficial	Slight beneficial
Well Below Objective/Limit Value With Scheme (<30 μg/m^3 of NO_2 or PM_{10}) (<18.75 μg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight beneficial

Note 1 Where the Impact Magnitude is Imperceptible, then the Impact Description is Negligible

Source: Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes - Transport Infrastructure Ireland (2011)

Table 8.4: Air Quality Impact Significance Criteria

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Beneficial

Note 1 *Where the Impact Magnitude is Imperceptible, then the Impact Description is Negligible*

Source: *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes - Transport Infrastructure Ireland (2011)*

8.2.2 Regional Impact Assessment (Including Climate)

The impact of the proposed development at a national / international level has been determined using the procedures given by Transport Infrastructure Ireland (TII 2011) and the methodology provided in Annex 2 in the UK Design Manual for Roads and Bridges (UK Highways Agency 2007). The assessment focused on determining the resulting change in emissions of volatile organic compounds (VOCs), nitrogen oxides (NO_x) and carbon dioxide (CO_2). The Annex provides a method for the prediction of the regional impact of emissions of these pollutants from road schemes and can be applied to any development that experiences a change in traffic values. The inputs to the air dispersion model consist of information on road link lengths, AADT movements and annual average traffic speeds.

8.2.3 Conversion of NO_x to NO_2

NO_x (NO + NO_2) is emitted by vehicles exhausts. The majority of emissions are in the form of NO, however, with greater diesel vehicles and some regenerative particle traps on HGV's the proportion of NO_x emitted as NO_2, rather than NO is increasing. With the correct conditions (presence of sunlight and O_3) emissions in the form of NO, have the potential to be converted to NO_2.

Transport Infrastructure Ireland states the recommended method for the conversion of NO_x to NO_2 in "Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes" (TII, 2011). Transport Infrastructure Ireland guidelines recommend the use of the UK Department for Environment, Food and Rural Affairs NO_x to NO_2 calculator (UK DEFRA, 2016) which was originally published in 2009 and is currently on version 5.1. This calculator (which can be downloaded in the form of an excel spreadsheet) accounts for the predicted availability of O_3 and proportion of NO_x emitted as NO for each Local Authority across the UK. O_3 is a regional pollutant and therefore concentrations do not vary in the same way as concentrations of NO_2 or PM_{10}.

The calculator includes Local Authorities in Northern Ireland and Transport Infrastructure Ireland guidance recommends the use of Craigavon as the choice for local authority when using the calculator. The choice of "*Armagh, Banbridge and Craigavon*" provides the most suitable relationship between NO_2 and NO_x for Ireland. The "All other Non-Urban UK Traffic" traffic mix option was used.

8.2.4 Ecological Sites

For routes which pass within 2 km of a designated area of conservation (either Irish or European designation) Transport Infrastructure Ireland requires consultation with an Ecologist (TII 2011). However, in practice the potential for impact to an ecological site is highest within 200 m of the proposed scheme and when significant changes in AADT (>5%) occur.

Transport Infrastructure Ireland's Guidelines for Assessment of Ecological Impacts of National Road Schemes (Rev. 2, Transport Infrastructure Ireland, 2009) and Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities (Department of the Environment, Heritage and Local Government, 2010) provide details regarding the legal protection of designated conservation areas.

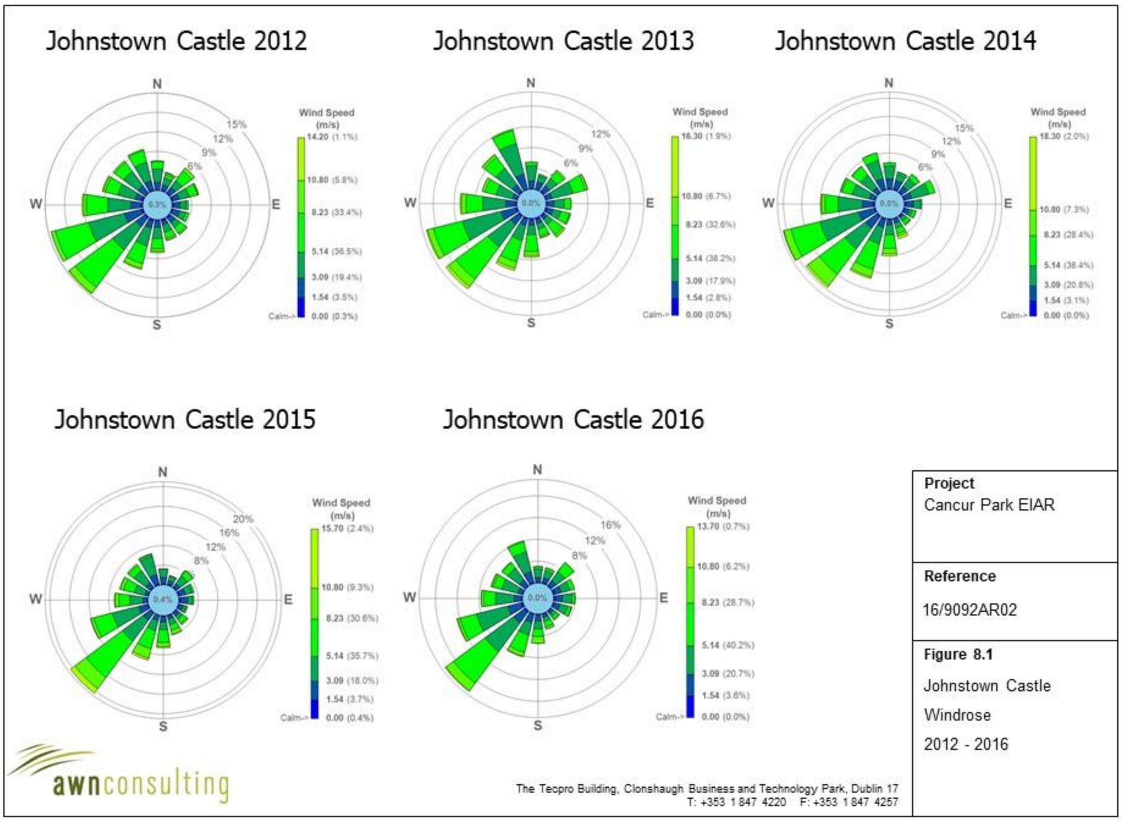
If the assessment criteria, of a designated area of conservation within 200 m of the proposed development and a significant change in AADT flows, are met an assessment of the potential for impact due to nitrogen deposition should be assessed. The proposed development has the following designated sites within its boundary;Slaney River SAC, Wexford Slobs and Harbour SPA. As both these sites are less than 200 m from the site an assessment is required.

8.3 RECEIVING ENVIRONMENT

8.3.1 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels) (WHO 2006). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM_{10}, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than $PM_{2.5}$) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles ($PM_{2.5}$ - PM_{10}) will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

The windrose from Johnstown Castle meteorological station for the years 2012 - 2016 is shown in Figure 8.1. The windrose indicate the prevailing wind speed and direction over the five-year period. The prevailing wind direction is from south to westerly in direction, with generally moderate wind speeds.



8.3.2 Trends in Air Quality

Air quality is variable and subject to both significant spatial and temporal variation. In relation to spatial variations in air quality, concentrations generally fall significantly with distance from major road sources (UK Highways Agency 2007). Thus, residential exposure is determined by the location of sensitive receptors relative to major roads sources in the area. Temporally, air quality can vary significantly by orders of magnitude due to changes in traffic volumes, meteorological conditions and wind direction.

In assessing baseline air quality, two tools are generally used: ambient air monitoring and air dispersion modelling. In order to adequately characterise the current baseline environment through monitoring, comprehensive measurements would be required at a number of key receptors for PM_{10}, NO_2 and benzene. In addition, two of the key pollutants identified in the scoping study (PM_{10} and NO_2) have limit values which require assessment over time periods varying from one hour to one year. Thus, continuous monitoring over at least a one-year period at a number of locations would be necessary in order to fully determine compliance for these pollutants. Although this study would provide information on current air quality it would not be able to provide predictive information on baseline conditions (UK DETR, 1998), which are the conditions which prevail just prior to opening in the absence of the development (Year 2020). Hence the impacts of the development were fully assessed by air dispersion modelling (UK DETR, 1998) which is the most practical tool for this purpose. The baseline environment has also been assessed using modelling, since the use of the same predictive technique for both the *'do-nothing*' and '*do-something*' scenario will minimise errors and allow an accurate determination of the relative impact of the development.

In 2011 the UK DEFRA published research (UK DEFRA 2011) on the long term trends in NO_2 and NO_X for roadside monitoring sites in the UK. This study marked a decrease in NO_2 concentrations between 1996 and 2002, after which the concentrations stabilised with little reduction between 2004 and 2010. The result of this is that there now exists a gap between projected NO_2 concentrations which UK DEFRA previously published and monitored concentrations. The impact of this 'gap' is that the DMRB screening model can under-predict NO_2 concentrations for predicted future years. Subsequently, the UK Highways Agency (HA) published an Interim advice note (IAN 170/12) in order to correct the DMRB results for future years.

8.3.3 Baseline Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality "Air Quality Monitoring Annual Report 2016" (EPA 2017), details the range and scope of monitoring undertaken throughout Ireland.

As part of the implementation of the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA 2016). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D. In terms of air monitoring, the region of the proposed development is categorised as Zone C (EPA 2017).

Long-term monitoring data has been used to determine background concentrations for the key pollutants in the region of the proposed development. The background concentration accounts for all non-traffic derived emissions (e.g. natural sources, industry, home heating etc.).

With regard to NO_2, continuous monitoring data from the EPA in the Zone C monitoring stations of Kilkenny Seville Lodge and Portlaoise show that current levels of NO_2 are below both the annual and 1-hour limit values (see Table 8.5) with average long term annual mean concentrations ranging from 7 to 11 µg/m^{3}in 2016. Based on these results, a conservative estimate of the background NO_2 concentration in the region of the proposed development in 2016 is 11 µg/m^3.

Table 8.5: Annual Mean NO_2 Concentrations in Zone C Locations (2012-2016) (µg/m^3)

Station	Averaging Period	Year				
		2012	2013	2014	2015	2016
Kilkenny Seville Lodge	Annual Mean NO_2 (µg/m^3)	4	4	5	5	7
	Max 1-hr NO_2 (µg/m^3)	62	90	57	70	43
Portlaoise	Annual Mean NO_2 (µg/m^3)	-	-	16	10	11
	Max 1-hr NO_2 (µg/m^3)	-	-	74	84	36

In terms of CO, the average annual mean concentration in the Zone C locations of Portlaoise, Mullingar and Balbriggan for 2012 to 2016 was 0.43 mg/m^3. This is well below the limit value of 10 mg/m^3 (EPA 2016). 2014 to 2016 annual mean concentrations ranged from 0.4 – 0.5 mg/m^3. Based on this EPA data, a conservative estimate of the background carbon monoxide concentration in Wexford in 2016 is 0.43 mg/m^3.

In terms of benzene, the average annual mean concentration in the Zone C locations of Mullingar and Kilkenny for 2012 to 2016 was 0.28 µg/m^3. This is well below the limit value of 5 µg/m^3(EPA 2016). 2013 to 2016 annual mean concentrations ranged from 0.09 – 0.5 µg/m^3. Based on this EPA data, a conservative estimate of the background benzene concentration in Wexford in 2016 is 0.7 µg/m^3.

Continuous PM_{10} monitoring carried out at the Zone C locations of Galway, Portlaoise and Ennis showed average long term annual mean concentrations of 11 – 22 µg/m^3, with at most 12 exceedances (in 2016 at Ennis) of the 24-hour limit value of 50 µg/m^3 (35 exceedances are permitted per year) (EPA 2016) (Table 8.6). Based on these results, a conservative estimate of the background PM_{10} concentration in the region of the proposed development in 2016 is 17 µg/m^3.

Table 8.6: Annual Mean PM_{10} Concentrations in Zone C Locations (2011-2015) (µg/m^3)

Station	Averaging Period	Year				
		2012	2013	2014	2015	2016
Galway	Annual Mean (µg/m^3)	16	21	15	15	15
	24-hr Mean > 50 µg/m^3 (days)	1	11	0	2	3
Portlaoise	Annual Mean (µg/m^3)	-	-	12	12	17
	24-hr Mean > 50 µg/m^3 (days)	-	-	2	1	1
Ennis	Annual Mean (µg/m^3)	19	20	21	18	12
	24-hr Mean > 50 µg/m^3 (days)	8	8	8	10	12

Continuous $PM_{2.5}$ monitoring carried out at the Zone C location of Ennis, showed average levels of 7 - 16 µg/m^3 between 2012 and 2016. The annual average level measured in Ennis in 2016 was 8 µg/m^3, with an average $PM_{2.5}/PM_{10}$ ratio of 0.7. Based on this information, a ratio of 0.7 was used to generate a background $PM_{2.5}$ concentration in the region of the proposed development in 2016 of 12 µg/m^3.

8.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development will involve the construction of the Carcur Park residential development. The development has an opening year of 2020 and design year of 2035. When considering a development of this nature, the potential air quality and climate impact on the surroundings must be considered for each of two distinct stages:

A. construction phase, and;
B. operational phase.

The primary sources of air and climatic emissions in the operational context are deemed long term and will involve the change in traffic flows or congestion in the local area which are associated with the development.

During the operational phase of the development there will be different sources of potential air quality impacts. The following describes the primary sources of potential air quality impacts which are deemed long term and which have been assessed in detail as part of this EIAR.

8.5 POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT

8.5.1 Construction Phase

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust and PM_{10}/$PM_{2.5}$ emissions (Table 8.7). While construction dust tends to be deposited within 200m of a construction site, the majority of the deposition occurs within the first 50m. There are sensitive receptors, predominantly residential properties in close proximity to the site.

There is the potential for a number of greenhouse gas emissions to the atmosphere during the construction phase of the development. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions.

Table 8.7: Assessment Criteria for the Impact of Dust from Construction, with Standard Mitigation in Place (TII 2011)

Source		Potential Distance for Significant Effects (Distance From Source)		
Scale	**Description**	**Soiling**	**PM_{10}**	**Vegetation Effects**
Major	Large construction sites, with high use of haul roads	100m	25m	25m
Moderate	Moderate sized construction sites, with moderate use of haul roads	50m	15m	15m
Minor	Minor construction sites, with limited use of haul roads	25m	10m	10m

8.5.2 Operational Phase

Air Quality

There is the potential for a number of emissions to the atmosphere during the operational phase of the development. In particular, the traffic-related air emissions may generate quantities of air pollutants such as NO_2, CO, benzene, $PM_{10}$and $PM_{2.5}$.

Climate

There is the potential for a number of greenhouse gas emissions to atmosphere during the operational phase of the development. Road traffic and space heating of buildings may give rise to CO_2 and N_2O emissions. There is the potential for a number of greenhouse gas emissions to atmosphere during the operational phase of the development.

8.6 AMELIORATIVE, REMEDIAL OR REDUCTIVE MEASURES

In order to sufficiently ameliorate the likely air quality impact, a schedule of air control measures has been formulated for both construction and operational phases associated with the proposed development.

8.6.1 Construction Phase

Air Quality

The greatest potential impact on air quality during the construction phase is from construction dust emissions, PM_{10}/$PM_{2.5}$ emissions and the potential for nuisance dust.

In order to minimise dust emissions during construction, a series of mitigation measures have been prepared in the form of a dust minimisation plan. Due to the sensitivity of the current residential receptors to the site additional mitigation measures recommended in the Institute of Air Quality Management *Guidance on the Assessment of Dust from Demolition and Construction* (2014) for sensitive receptors have been included. Provided the dust minimisation measures outlined in the Plan (see Appendix 8.3) and construction management plan are adhered to, the air quality impacts during the construction phase should be not be significant.

In summary the measures which will be implemented will include:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads.
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site road, this will be 20 kph, and on hard surfaced roads as site management dictates.
- Vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust.
- Public roads outside the site will be regularly inspected for cleanliness, and cleaned as necessary.

- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Climate

Construction vehicles, generators etc., may give rise to some CO_2 and N_2O emissions. However, due to the short-term and temporary nature of these works the impact on climate will not be significant.

8.6.2 Operational Phase

Air Quality

Mitigation measures in relation to traffic-derived pollutants have focused generally on improvements in both engine technology and fuel quality. EU legislation, based on the EU sponsored Auto-Oil programmes, has imposed stringent emission standards for key pollutants (REGULATION (EC) No 715/2007) for passenger cars which was complied with in 2009 (Euro V) and 2014 (Euro VI).

As outlined in TII (2011), the guidance states that "for the purpose of the EIAR, it should be assumed that pollutant concentrations will decline in future years, as a result of various initiatives to reduce vehicle emissions both in Europe and in Ireland" (Page 52). A range of legislation in Europe over the period 1992 – 2013 has significantly reduced the allowable steady cycle emissions of both NO_X and PM from road vehicles with NO_X emission reductions for HDV (Heavy Diesel Vehicles) a factor of 20 and PM a factor of 36 over this period (Euro I to Euro VI). In relation to LDV (Light Diesel Vehicles) the reduction of NO_X and PM from road vehicles has also been significant with NO_X emission reductions from HDV a factor of 12 and PM a factor of 40 over this period (Euro I to Euro VI). Although actual on-road emission reductions will be less dramatic, significant reductions in vehicle-related NO_X and PM emissions are to be expected over the next 5-10 years as the fleet turns over.

Emissions of pollutants from road traffic can be controlled most effectively by either diverting traffic away from heavily congested areas or ensuring free flowing traffic through good traffic management plans and the use of automatic traffic control systems (UK Department for Environment, Food and Rural Affairs, 2016b).

Climate

Improvements in air quality are likely over the next few years as a result of the on-going comprehensive vehicle inspection and maintenance program, fiscal measures to encourage the use of alternatively fueled vehicles and the introduction of cleaner fuels.

CO_2 emissions for the average new car fleet were reduced to 120 g/km by 2012 through EU legislation on improvements in vehicle motor technology and by an increased use of biofuels. This measure has reduced CO_2 emissions from new cars by an average of 25% in the period from 1995 to 2008/2009 whilst 15% of the necessary effort towards the overall climate change target of the EU has been met by this measure alone (Department of Environment, Heritage and Local Government, 2000).

Additional measures included in the National Climate Change Strategy (Department of Environment, Heritage and Local Government, 2006, 2007) include: (1) VRT and Motor Tax rebalancing to favour the purchase of more fuel-efficient vehicles with lower CO_2 emissions; (2) continuing the Mineral Oils Tax Relief II Scheme and introduction of a biofuels obligation scheme; (3) implementation of a national efficient driving awareness campaign, to promote smooth and safe driving at lower engine revolutions; and (4) enhancing the existing mandatory vehicle labelling system to provide more information on CO_2 emission levels and on fuel economy.

8.7 PREDICTED IMPACTS OF THE PROPOSED DEVELOPMENT

8.7.1 Construction Phase

Air Quality

When the dust minimisation measures detailed in the mitigation section of this Chapter are implemented, fugitive emissions of dust from the site will be insignificant and pose no nuisance at nearby receptors.

Climate

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

8.7.2 Operational Phase

Local Air Quality

The results of the air dispersion modelling study indicate that the residual impacts of the proposed development on air quality and climate are predicted to be imperceptible with respect to the operational phase local air quality assessment for the long and short term.

The receptors modelled represent the worst-case locations close to the proposed development and were chosen due to their close proximity (within 200 m) to the road links impacted by proposed development. The worst case traffic data used in this assessment is shown in Table 8.8, with the percentage of HGV's shown in parenthesis below the AADT. Four sensitive residential receptors in the vicinity of the proposed development have been assessed. Sensitive receptors have been chosen as they have the potential to be adversely impacted by the development, these receptors are shown in Table 8.9.

Table 8.8:Traffic Data used in this Assessment

Link	Road Name	Speed	Base Year	Do-Nothing		Do-Something	
			2016	2020	2035	2020	2035
1	To Wexford Hospital	50	3825 (1%)	4058 (1%)	4781 (1%)	4335 (1%)	5350 (1%)
2	West Old Hospital Road	50	2005 (1%)	2127 (1%)	2506 (1%)	2250 (1%)	2765 (1%)
3	East Old Hospital Road	50	810 (1%)	859 (1%)	1013 (1%)	890 (1%)	1110 (1%)
4	Stoney Park	50	1050 (1%)	1114 (1%)	1313 (1%)	1375 (1%)	1655 (1%)
5	R730 West	50	4480 (1%)	4753 (1%)	5600 (1%)	5540 (1%)	6820 (1%)
6	R730 East	50	3915 (1%)	4154 (1%)	4894 (1%)	4670 (1%)	5735 (1%)
7	Road to Proposed Site	50	385 (1%)	408 (1%)	481 (1%)	2160 (1%)	2440 (1%)

Note: Traffic data expressed in AADT, percentage HGV shown in parenthesis

Table 8.9:Description of Sensitive Receptors (UTM Co-ordinates)

Name	Receptor Type	X	Y
R1	Residential	671079	5802806
R2	Residential	671401	5802603
R3	Residential	671279	5802477
R4	Residential	670856	5802737

Transport Infrastructure Ireland Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (TII 2011) detail a methodology for determining air quality impact significance criteria for road schemes. The degree of impact is determined based on both the absolute and relative impact of the proposed development. Therefore, in order to assess the impact of the scheme using the 'Do Something' modelling scenario, the 'Do Nothing' modelling scenario must first be assessed.

"Do Nothing" Scenario

CO and Benzene

The results of the "do nothing" modelling assessment for CO and benzene in the opening and design years are shown in Table 8.10 and Table 8.11. Concentrations are well within the limit values at all worst-case receptors. Levels of both pollutants are at maximum 26% and 28% of the respective limit values in 2020, and 26% and 28% in 2035.

PM_{10}

The results of the "do nothing" modelling assessment for PM_{10} in the opening and design years are shown in Table 8.12. Concentrations are well within the annual limit value at all worst-case receptors. In addition, the 24-hour PM_{10} concentration of 50 µg/m^3, which can only be exceeded 35 times per year within the limit, is found to be in compliance at all receptors (Table 8.13). There are at maximum of one day of exceedance predicted at any of the four receptors. Annual average PM_{10} concentrations are 42% of the limit value in 2020 and 2035.

$PM_{2.5}$
The results of the "do nothing" modelling assessment for $PM_{2.5}$ in the opening and design years are shown in Table 8.14. The predicted concentrations at all worst-case receptors are well below the $PM_{2.5}$ limit value of 25 µg/m^3. The annual average $PM_{2.5}$ concentration peaks at 43% of the limit value in 2020 and 2035.

NO_2
The results of the "do nothing" assessment of annual average NO_2 concentrations in the opening and design years are shown in Table 8.15 for the Highways Agency IAN 170/12 and Table 8.16 using the UK Department for Environment, Food and Rural Affairs technique respectively. The purpose of IAN 170/12 was to account for the conclusions of UK's Department for Environment, Food and Rural Affairs advice on long term trends that there is now a gap between current projected vehicle emission reductions and projections on the annual rate of improvements in ambient air quality as previously published in UK Department for Environment, Food and Rural Affairs technical guidance and observed trends. Hence, the projections calculated via the IAN 170/12 technique show a slower than previously predicted reduction between the base year and future year predictions. The concentrations are below the limit value at all locations, with levels ranging up to 29% of the limit value in 2020 and 28% in 2035, using the more conservative IAN prediction.

The hourly limit value for NO_2 is 200 µg/m^3 is expressed as a 99.8th percentile (i.e. it must not be exceeded more than 18 times per year). The 1-hour limit value is not predicted to be exceeded for the "do nothing" scenario in either 2020 or 2035 (Table 8.17).

"Do Something" Scenario

CO and Benzene
The results of the modelled impact of the scheme for CO and benzene in the opening and design years are shown in Table 8.10 and Table 8.11 respectively. Predicted pollutant concentrations with the proposed development in place are below the ambient standards at all locations. Levels of both pollutants range from 26% to 28% of the respective limit values in 2020, for 2035 the predicted concentrations are 26% to 28% of the limit values respectively. Future trends indicate similarly low levels of CO and benzene. There are some increases in traffic flows between 2020 and 2035, therefore any reduction in concentrations is due to reduced background concentrations and greater efficiencies predicted in engines.

The impact of the proposed development can be assessed relative to "Do Nothing" levels in 2020 and 2035. Relative to baseline levels, some imperceptible increases in pollutant levels at the worst-case receptors are predicted as a result of the proposed development. The greatest impact on CO and benzene concentrations in either 2020 and 2035 will be an increase of 0.18% of their respective limit values at Receptor 2. Thus, using the assessment criteria for NO_2 and PM_{10} and applying these criteria to CO and benzene, the impact of the proposed development in terms of CO and benzene is negligible.

PM_{10}
The results of the modelled impact of the proposed development for PM_{10} in the opening and design years are shown in Table 8.12. Predicted annual average concentrations in the region of the proposed development are below the ambient standards at all worst-case receptors with levels 42% of the limit value in 2020. In addition, the 24-hour PM_{10} concentration of 50 µg/m^3, which can only be exceeded 35 times per year whist remaining

in compliance with the limit value, is found to be in compliance at all receptors. It is predicted that the worst case receptors will have one exceedance of the 50 μg/m^3 24-hour mean value in 2020 and 2035 (Table 8.13). Future trends with the proposed development in place indicate similarly low levels of PM_{10}. Annual average PM_{10} concentrations are also 42% of the limit in 2035.

The impact of the proposed development can be assessed relative to "Do Nothing" levels in 2020 and 2035. Relative to baseline levels, some imperceptible increases in PM_{10} levels at the worst-case receptors are predicted as a result of the proposed development. With regard to impacts at individual receptors, none of the four receptors assessed will experience an increase in concentrations of over 0.15% of the limit value in 2020 and 2035. Thus the magnitude of the changes in air quality are imperceptible at all receptors based on the criteria outlined in Table 8.2 to Table 8.4.

The greatest impact on PM_{10} concentrations in the region of the proposed development in either 2020 or 2035 will be an increase of 0.14% of the annual limit value at Receptor 2. Thus, using the assessment criteria outlined in Table 8.2 and Table 8.4, the impact of the proposed development with regard to PM_{10} is negligible at all four of the receptors assessed.

$PM_{2.5}$

The results of the modelled impact of the proposed development for $PM_{2.5}$ in the opening and design years are shown in Table 8.14. Predicted annual average concentrations in the region of the proposed development are below the ambient standards at all worst-case receptors, with levels of 44% of the limit value in 2020. Future trends with the proposed development in place indicate similarly low levels of $PM_{2.5}$. Annual average $PM_{2.5}$ concentrations are 44% of the limit in 2035.

The impact of the proposed development can be assessed relative to "Do Nothing" levels in 2020and 2035. Relative to baseline levels, imperceptible increases in $PM_{2.5}$ levels at the worst-case receptors are predicted as a result of the proposed development. None of the four receptors assessed will experience an increase or decrease in concentrations of over 0.15% of the limit value in 2020 and 2035. Thus, the magnitude of the changes in air is negligible at all receptors based on the criteria outlined in Table 8.2 and Table 8.3.

NO_2

The result of the assessment of the impact of the proposed development for NO_2 in the opening and design years are shown in Table 8.15 for the Highways Agency IAN 170/12 and Table 8.16 using the UK Department for Environment, Food and Rural Affairs technique, respectively. The annual average concentration is within the limit value at all worst-case receptors using both the UK Department for Environment, Food and Rural Affairs and more conservative IAN technique. Levels of NO_2 are 30% and 28% of the annual limit value in 2020 and 2035 using the IAN technique, while concentrations are 23% and 19% of the annual limit value in 2020 and 2035 using the UK Department for Environment, Food and Rural Affairs technique. Maximum one-hour NO_2 levels with the proposed development in place are not predicted to exceed using either technique. The impact of the proposed development on annual mean NO_2 levels can be assessed relative to "Do Nothing" levels in 2020 and 2035. Relative to baseline levels, some imperceptible increases in pollutant levels are predicted as a result of the proposed development. With regard to impacts at individual receptors, none of the four receptors assessed will experience an increase in concentrations of over 0.84% of the limit value in 2020 and 2035. Thus, using the assessment criteria outlined in Table 8.2 and Table 8.3, the impact of the proposed development in terms of NO_2 is negligible at all of the receptors assessed.

The hourly limit value for NO_2 is 200 μg/m^3 is expressed as a 99.8th percentile (i.e. it must not be exceeded more than 18 times per year). The 1-hour limit value is not predicted to be exceeded forthe “Do Something” scenario in either 2020 or 2035 (Table 8.17).

Table 8.10: Maximum 8-hour CO Concentrations (mg/m^3)

Receptor	Impact Opening Year (2020)					Impact Design Year (2035)				
	DM	DS	DS-DM	Magnitude	Description	DM	DS	DS-DM	Magnitude	Description
1	2.54	2.55	0.008	Imperceptible	Negligible Increase	2.54	2.56	0.011	Imperceptible	Negligible Increase
2	2.57	2.58	0.012	Imperceptible	Negligible Increase	2.58	2.60	0.018	Imperceptible	Negligible Increase
3	2.53	2.53	0.001	Imperceptible	Negligible Increase	2.53	2.53	0.003	Imperceptible	Negligible Increase
4	2.51	2.51	0.000	Imperceptible	Negligible Increase	2.51	2.51	0.001	Imperceptible	Negligible Increase

Table 8.11: Annual Mean Benzene Concentrations ($\mu g/m^3$)

Receptor	Impact Opening Year (2020)					Impact Design Year (2035)				
	DM	DS	DS-DM	DM	DS	DM	DM	DS	Magnitude	DM
1	1.41	1.41	0.002	Imperceptible	Negligible Increase	1.41	1.41	0.003	Imperceptible	Negligible Increase
2	1.42	1.42	0.003	Imperceptible	Negligible Increase	1.42	1.42	0.004	Imperceptible	Negligible Increase
3	1.41	1.41	0.000	Imperceptible	Negligible Increase	1.41	1.41	0.001	Imperceptible	Negligible Increase
4	1.40	1.40	0.000	Imperceptible	Negligible Increase	1.40	1.40	0.000	Imperceptible	Negligible Increase

Table 8.12: Annual Mean PM_{10} Concentrations ($\mu g/m^3$)

Receptor	Impact Opening Year (2020)					Impact Design Year (2035)				
	DM	DS	DS-DM	Magnitude	Description	DM	DS	DS-DM	Magnitude	Description
1	16.6	16.7	0.02	Imperceptible	Negligible Increase	16.8	16.8	0.04	Imperceptible	Negligible Increase
2	16.7	16.8	0.04	Imperceptible	Negligible Increase	16.9	16.9	0.06	Imperceptible	Negligible Increase
3	16.6	16.6	0.00	Imperceptible	Negligible Increase	16.7	16.7	0.01	Imperceptible	Negligible Increase
4	16.5	16.6	0.00s	Imperceptible	Negligible Increase	16.6	16.6	0.00	Imperceptible	Negligible Increase

Table 8.13: Number of days with PM_{10} concentration > 50 µg/m^3

Receptor	Opening Year (2020)		Design Year (2035)	
	DM	DS	DM	DS
1	1	1	1	1
2	1	1	1	1
3	1	1	1	1
4	1	1	1	1

Table 8.14: $PM_{2.5}$ Annual Mean $PM_{2.5}$ Concentrations (µg/m^3)

Receptor	Impact Opening Year (2020)					Impact Design Year (2035)				
	DM	DS	DS-DM	Magnitude	Description	DM	DS	DS-DM	Magnitude	Description
1	10.8	10.8	0.02	Imperceptible	Negligible Increase	10.9	10.9	0.02	Imperceptible	Negligible Increase
2	10.9	10.9	0.02	Imperceptible	Negligible Increase	11.0	11.0	0.04	Imperceptible	Negligible Increase
3	10.8	10.8	0.00	Imperceptible	Negligible Increase	10.9	10.9	0.01	Imperceptible	Negligible Increase
4	10.8	10.8	0.00	Imperceptible	Negligible Increase	10.8	10.8	0.00	Imperceptible	Negligible Increase

Table 8.15: Annual Mean NO_2 Concentrations (µg/m^3) (using Interim advice note 170/12 V3 Long Term NO_2 Trend Projections)

Receptor	Impact Opening Year (2020)					Impact Design Year (2035)				
	DM	DS	DS-DM	Magnitude	Description	DM	DS	DS-DM	Magnitude	Description
1	11.2	11.3	0.14	Imperceptible	Negligible Increase	10.5	10.7	0.22	Imperceptible	Negligible Increase
2	11.6	11.8	0.20	Imperceptible	Negligible Increase	11.0	11.4	0.34	Imperceptible	Negligible Increase
3	11.0	11.0	0.03	Imperceptible	Negligible Increase	10.3	10.4	0.06	Imperceptible	Negligible Increase
4	10.8	10.8	0.00	Imperceptible	Negligible Decrease	10.0	10.1	0.02	Imperceptible	Negligible Increase

Table 8.16: Annual Mean NO_2 Concentrations ($\mu g/m^3$) (using UK Department for Environment, Food and Rural Affairs Technical Guidance)

Receptor	Impact Opening Year (2020)					Impact Design Year (2035)				
	DM	DS	DS-DM	Magnitude	Description	DM	DS	DS-DM	Magnitude	Description
1	8.8	8.9	0.11	Imperceptible	Negligible Increase	7.1	7.2	0.15	Imperceptible	Negligible Increase
2	9.2	9.4	0.16	Imperceptible	Negligible Increase	7.6	7.8	0.23	Imperceptible	Negligible Increase
3	8.6	8.7	0.02	Imperceptible	Negligible Increase	6.9	6.9	0.04	Imperceptible	Negligible Increase
4	8.4	8.4	0.00	Imperceptible	Negligible Decrease	6.6	6.6	0.01	Imperceptible	Negligible Increase

Table 8.17: 99.8th percentile of daily maximum 1-hour for NO_2 concentrations ($\mu g/m^3$)

Receptor	IAN 170/12 V3 Long Term NO_2 Trend Projections Technique				Defra's Technical Guidance Technique			
	Opening Year (2020)		Design Year (2035)		Opening Year (2020)		Design Year (2035)	
	DM	DS	DM	DS	DM	DS	DM	DS
1	39.1	39.6	36.8	37.6	39.1	39.6	36.8	37.6
2	40.6	41.3	38.6	39.8	40.6	41.3	38.6	39.8
3	38.6	38.6	36.1	36.3	38.6	38.6	36.1	36.3
4	37.8	37.8	35.1	35.2	37.8	37.8	35.1	35.2

8.7.3Potential Impact on the Ecosystem

The EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the "Habitats Directive") requires an Appropriate Assessment to be carried out where there is likely to be a significant impact upon a European protected site. Such sites include Natural Heritage Areas (NHA), Special Areas of Conservation (SAC), Special Protection Areas (SPA), National Parks, Nature Reserves, Refuges for Fauna, Refuges for Flora, Wildfowl Sanctuaries, Ramsar Sites, Biogenetic Reserves and UNESCO Biosphere Reserves.

TII guidelines(TII, 2011) state that as the potential impact of a scheme is limited to a local level, detailed consideration need only be given to roads where there is a significant change to traffic flows (>5%) and the designated site lies within 200 m of the road centre line.

The impact of NO_x (i.e. NO and NO_2) emissions resulting from the proposed road at the Slaney River SACandWexford Slobs and Harbour SPAwas assessed. The site is within the SAC and SPA. Dispersion modelling and prediction was carried out at typical traffic speeds at this location. Ambient NO_x concentrations predicted for the opening and design years along a transect of up to 200m within the Slaney River SACandWexford Slobs and Harbour SPAare given in Table 8.18. The road contribution to dry deposition along the transect is also given and was calculated using the methodology of TII (TII, 2011).

The predicted annual average NO_x level in the Slaney River SACandWexford Slobs and Harbour SPAis within the limit value of 30 μg/m^3 for the “do nothing” scenario in 2020 and 2035,with NO_x concentrations reaching 51% of this limit in 2020 and 38% in 2035. Levels with the proposed development in place are similar reaching 53% of the limit value for the “do something” scenario in 2020 and 41% of the limit value in 2035.

The predicted annual average NO_x levels at the Slaney River SACandWexford Slobs and Harbour SPAis within the limit value of 30 μg/m^3 for the “do something” scenario in both the opening and design years. The impact of the proposed development leads to an increase in NO_x concentrations of less than1.2 μg/m^3 at the Slaney River SAC and Wexford Slobs and Harbour SPA. TII guidelines state in Appendix 9 that where the scheme is expected to cause an increase of more than 2 μg/m^3 and the predicted concentrations (including background) are close to, or exceed the standard, then the sensitivity of the habitat to NO_X should be assessed by the project ecologist. Due to the1.2 μg/m^3 increase in NO_x levels the ecological impact due to the proposed developmentdoes not require assessment by the project ecologist.

The road contribution to the NO_2 dry deposition rate along the transect within the Slaney River SACis also detailed in Table 8.18. The maximum decrease in the NO_2 dry deposition rate is 0.05 Kg(N)/ha/yr in 2020and 0.06 Kg(N)/ha/yr in 2035. This is a negligible increase within the Slaney River SAC and Wexford Slobs and Harbour SPAfor NO_2 dry deposition due to the proposed development.

Table 8.18: Air Quality Assessment of Ecosystems, Proposed Carcur Park Development. Assessment of Impact on Slaney River SAC, Wexford Slobs and Harbour SPA.

Dist. To Road (m)	NO_x Conc. (µg/m^3) - 2020			NO_x Conc. (µg/m^3) - 2035			NO_2 Dry Deposition Rate Impact (Kg(N) /ha/yr)	
	Do Minimum	Do Something	Impact	Do Minimum	Do Something	Impact	2017	2032
10	15.21	16.04	0.84	11.29	11.06	-0.23	0.05	0.06
20	15.16	15.79	0.63	11.23	11.06	-0.17	0.05	0.05
30	15.12	15.61	0.49	11.19	11.06	-0.13	0.04	0.04
40	15.10	15.48	0.38	11.16	11.06	-0.10	0.03	0.03
50	15.08	15.38	0.30	11.14	11.06	-0.08	0.02	0.02
60	15.07	15.30	0.23	11.12	11.06	-0.06	0.02	0.02
70	15.05	15.24	0.18	11.11	11.06	-0.05	0.01	0.01
80	15.05	15.19	0.15	11.10	11.06	-0.04	0.01	0.01
90	15.04	15.15	0.11	11.09	11.06	-0.03	0.01	0.01
100	15.03	15.12	0.09	11.08	11.06	-0.02	0.01	0.01
110	15.03	15.10	0.07	11.08	11.06	-0.02	0.01	0.01
120	15.02	15.08	0.05	11.07	11.06	-0.01	0.00	0.00
130	15.02	15.06	0.04	11.07	11.06	-0.01	0.00	0.00
140	15.02	15.05	0.03	11.07	11.06	-0.01	0.00	0.00
150	15.02	15.05	0.03	11.07	11.06	-0.01	0.00	0.00
160	15.02	15.04	0.03	11.06	11.06	-0.01	0.00	0.00
170	15.02	15.04	0.02	11.06	11.06	-0.01	0.00	0.00
180	15.02	15.04	0.02	11.06	11.06	-0.01	0.00	0.00
190	15.02	15.03	0.02	11.06	11.06	0.00	0.00	0.00
200	15.01	15.01	0.00	11.06	11.06	0.00	0.00	0.00
Standards	30 µg/m^3	30 µg/m^3		30 µg/m^3	30 µg/m^3		5 - 10 Kg(N)/ha/yr	

8.7.4Potential Regional Impacts –Air Quality

The regional impact of the proposed residential development on emissions of NO_x and VOCs has been assessed using the procedures of Transport Infrastructure Ireland (TII, 2011) and the UK Department for Environment, Food and Rural Affairs (UK DEFRA 2007). The results (see Table 8.19) indicate that the impact of the proposed development on Ireland's obligations under the Targets set out by "*Proposal for a Directive on the reduction of national emissions of certain atmospheric pollutants and amending Directive 2003/35/EC*" are negligible. For the assessment year of 2020, the predicted impact of the changes in AADT is to increase NO_x levels by 0.00038% of the NO_x emissions ceiling and decrease VOC levels by 0.0001725% of the VOC emissions ceiling to be complied with in 2020. For the assessment year of 2035, the predicted impact of the changes in AADT is to increase NO_x levels by 0.001122% of the NO_x emissions ceiling and decrease VOC levels by 0.000274% of the VOC emissions ceiling to be complied with in 2035.

8.7.5 Potential Regional Impacts –Climate Impacts

The regional impact of the proposed residential development on emissions of CO_2 were also assessed using the Design Manual for Roads and Bridges screening model (see Table 8.19). The results show that the impact of the proposed road in 2020 will be to decrease CO_2 emissions by 0.000323% of Ireland's EU 2020 Target. In the design year of 2035, the proposed road will decrease CO_2 emissions by 0.00047 % of EU 2020 Target. Thus, the impact of the proposed road development on national greenhouse gas emissions will be insignificant in terms of Ireland's obligations under the EU 2020 Target (EPA, 2013).

Table 8.19: Air Quality Assessment of Regional Air Quality Assessment.

Year	Scenario	VOC (kg/annum)	NO_X (kg/annum)	CO_2 (tonnes/annum)
2020	Do Nothing	420	1115	713
	Do Something	500	1329	849
2035	Do Nothing	491	1312	841
	Do Something	607	1620	1040
Increment in 2020			80.2 kg	213.2 kg
Increment in 2035			115.6 kg	308.7 kg
Emission Ceiling (kilo Tonnes) 2020		46.5 [Note 1]	56.1 [Note 1]	42,100 [Note 2]
Emission Ceiling (kilo Tonnes) 2035		42.2 [Note 1]	27.5 [Note 1]	42,100 [Note 2]
Impact in 2020 (%)		0.0001725 %	0.00038 %	0.0003237183 %
Impact in 2035 (%)		0.0002742 %	0.001122 %	0.0004703947 %

[Note 1] Targets under the "*Proposal for a Directive on the reduction of national emissions of certain atmospheric pollutants and amending Directive 2003/35/EC*"

[Note 2] 20-20-20 Climate and Energy Package

With respect to climate change impacts on the proposed development, the greatest impact is predicted to be due to flooding. A Site Specific Flood Risk Assessment has been prepared for the subject lands and its findings have been incorporated into this EIAR. By raising the site above the level of predicted 1:000 year flood risk events, flooding will be prevented.

8.8 WORST CASE SCENARIO

In order to protect nearby sensitive receptors, worst case construction and operational phase impacts have been assumed throughout the assessment.

Potential construction phase impacts have been taken to be worst case and therefore strict mitigation measures have been outlined in a dust minimisation plan (Appendix 8.3) and construction management plan. The mitigation measures for dust are designed with a number of layers of protocol, therefore if one fails in the short-term it should be eliminated by the next. Construction dust monitoring should be put in place to ensure that, should mitigation measures fail and construction dust impacts occur, they will be short term in nature.

As stated in the previous sections, worst case receptors and traffic data have been chosen when modelling air quality impacts in the operational phase. These receptors are located on road links which will experience traffic impacts due to the proposed development. Therefore, it is assumed that the predicted impact discussed in Section 8.7 is the worst case operational impact.

8.9 REFERENCES

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UK Highways Agency (2012) Updated air quality advice on the assessment of future NO_x and NO_2 projections for users of DMRB Volume 11, Section 3, Part 1 'Air Quality

UK Highways Agency (2007) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 - HA207/07 (Document & Calculation Spreadsheet)

World Health Organisation (WHO) (2006) Air Quality Guidelines - Global Update 2005 (and previous Air Quality Guideline Reports 1999 & 2000)

APPENDIX 8.1

National standards for ambient air pollutants in Ireland have generally ensued from Council Directives enacted in the EU (& previously the EC & EEC). The initial interest in ambient air pollution legislation in the EU dates from the early 1980s and was in response to the most serious pollutant problems at that time. In response to the problem of acid rain, sulphur dioxide, and later nitrogen dioxide, were both the focus of EU legislation. Linked to the acid rain problem was urban smog associated with fuel burning for space heating purposes. Also apparent at this time were the problems caused by leaded petrol and EU legislation was introduced to deal with this problem in the early 1980s.

In recent years the EU has focused on defining a basis strategy across the EU in relation to ambient air quality. In 1996, a Framework Directive, Council Directive 96/62/EC, on ambient air quality assessment and management was enacted. The aims of the Directive are fourfold. Firstly, the Directive's aim is to establish objectives for ambient air quality designed to avoid harmful effects to health. Secondly, the Directive aims to assess ambient air quality on the basis of common methods and criteria throughout the EU. Additionally, it is aimed to make information on air quality available to the public via alert thresholds and fourthly, it aims to maintain air quality where it is good and improve it in other cases.

As part of these measures to improve air quality, the European Commission has adopted proposals for daughter legislation under Directive 96/62/EC. The first of these directives to be enacted, Council Directive 1999/30/EC, was passed into Irish Law as S.I. No 271 of 2002 (Air Quality Standards Regulations 2002), and has set limit values which came into operation on 17th June 2002. The Air Quality Standards Regulations 2002 detail margins of tolerance, which are trigger levels for certain types of action in the period leading to the attainment date. The margin of tolerance varies from 60% for lead, to 30% for 24-hour limit value for PM_{10}, 40% for the hourly and annual limit value for NO_2 and 26% for hourly SO_2 limit values. The margin of tolerance commenced from June 2002, and started to reduce from 1 January 2003 and does so every 12 months by equal annual percentages to reach 0% by the attainment date. A second daughter directive, EU Council Directive 2000/69/EC, details limit values for both carbon monoxide and benzene in ambient air. This has also been passed into Irish Law under the Air Quality Standards Regulations 2002.

The most recent EU Council Directive on ambient air quality was published on the 11/06/08. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive and its subsequent daughter directives. This has also been passed into Irish Law under the Air Quality Standards Regulations 2011 (S.I. 180 of 2011). Provisions were also made for the inclusion of new ambient limit values relating to $PM_{2.5}$. In regards to existing ambient air quality standards, it is not proposed to modify the standards but to strengthen existing provisions to ensure that non-compliances are removed. In addition, new ambient standards for $PM_{2.5}$ are included in Directive 2008/50/EC. The approach for $PM_{2.5}$ is to establish a target value of 25 µg/m^3, as an annual average (to be attained everywhere by 2010) and a limit value of 25 µg/m^3, as an annual average (to be attained everywhere by 2018), coupled with a target to reduce human exposure generally to $PM_{2.5}$ between 2010 and 2020. This exposure reduction target will range from 0% (for $PM_{2.5}$ concentrations of less than 8.5 µg/m^3 to 20% of the average exposure indicator (AEI) for concentrations of between 18 - 22 µg/m^3. Where the AEI is currently greater than 22 µg/m^3 all appropriate measures should be employed to reduce this level to 18 µg/m^3 by 2020. The AEI is based on measurements taken in urban background locations averaged over a three year period from 2008-2010 and again from 2018-2020.

Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions. The Alert Threshold is defined in Council Directive 2008/50/EC as "a level beyond which there is a risk to human health from brief exposure and at which immediate steps shall be taken as laid down in Directive 2008/50/EC". These steps include undertaking to ensure that the necessary steps are taken to inform the public (e.g. by means of radio, television and the press).

The Margin of Tolerance is defined in Council Directive 2008/50/EC as a concentration which is higher than the limit value when legislation comes into force. It decreases to meet the limit value by the attainment date. The Upper Assessment Threshold is defined in Council Directive 2008/50/EC as a concentration above which high quality measurement is mandatory. Data from measurement may be supplemented by information from other sources, including air quality modelling.

An annual average limit for both NO_x (NO and NO_2) is applicable for the protection of vegetation in highly rural areas away from major sources of NO_x such as large conurbations, factories and high road vehicle activity such as a dual carriageway or motorway. Annex III of EU Directive 2008/50/EC identifies that monitoring to demonstrate compliance with the NO_X limit for the protection of vegetation should be carried out distances greater than:

- 5 km from the nearest motorway or dual carriageway
- 5 km from the nearest major industrial installation
- 20 km from a major urban conurbation

As a guideline, a monitoring station should be indicative of approximately 1000 km^2 of surrounding area.

Under the terms of EU Framework Directive on Ambient Air Quality (96/62/EC), geographical areas within member states have been classified in terms of zones. The zones have been defined in order to meet the criteria for air quality monitoring, assessment and management as described in the Framework Directive and Daughter Directives. Zone A is defined as Dublin and its environs, Zone B is defined as Cork City, Zone C is defined as 23 urban areas with a population greater than 15,000 and Zone D is defined as the remainder of the country. The Zones were defined based on among other things, population and existing ambient air quality.

EU Council Directive 96/62/EC on ambient air quality and assessment has been adopted into Irish Legislation (S.I. No. 33 of 1999). The act has designated the Environmental Protection Agency (EPA) as the competent authority responsible for the implementation of the Directive and for assessing ambient air quality in the State. Other commonly referenced ambient air quality standards include the World Health Organisation. The WHO guidelines differ from air quality standards in that they are primarily set to protect public health from the effects of air pollution. Air quality standards, however, are air quality guidelines recommended by governments, for which additional factors, such as socio-economic factors, may be considered.

APPENDIX 8.2

The inputs to the Design Manual for Roads and Bridges model consist of information on road layouts, receptor locations, annual average daily traffic movements, annual average traffic speeds and background concentrations. Using this input data the model predicts ambient ground level concentrations at the worst-case sensitive receptor using generic meteorological data.

The Design Manual for Roads and Bridges underwent an extensive validation exercise as part of the UK's Review and Assessment Process to designate areas as Air Quality Management Areas (AQMAs). The validation exercise was carried out at 12 monitoring sites within the UK Department for Environment, Food and Rural Affairs national air quality monitoring network. The validation exercise was carried out for NO_x, NO_2 and PM_{10}, and included urban background and kerbside/roadside locations, "open" and "confined" settings and a variety of geographical locations.

In relation to NO_2, the model generally over-predicts concentrations, with a greater degree of over-prediction at "open" site locations. The performance of the model with respect to NO_2 mirrors that of NO_x showing that the over-prediction is due to NO_x calculations rather than the NO_x:NO_2 conversion. Within most urban situations, the model overestimates annual mean NO_2 concentrations by between 0 to 40% at confined locations and by 20 to 60% at open locations. The performance is considered comparable with that of sophisticated dispersion models when applied to situations where specific local validation corrections have not been carried out.

The model also tends to over-predict $PM_{10.}$ Within most urban situations, the model will over-estimate annual mean PM_{10} concentrations by between 20 to 40%. The performance is comparable to more sophisticated models, which, if not validated locally, can be expected to predict concentrations within the range of $\pm$50%.

Thus, the validation exercise has confirmed that the model is a useful screening tool for the Second Stage Review and Assessment, for which a conservative approach is applicable.

APPENDIX 8.3

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

In order to ensure mitigation of the effects of dust nuisance, a series of measures will be implemented. Site roads shall be regularly cleaned and maintained as appropriate, dry sweeping of large areas should be avoided. Hard surface roads shall be swept to remove mud and aggregate materials from their surface while any un-surfaced roads shall be restricted to essential site traffic only. Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.

Vehicles using site roads shall have their speeds restricted where there is a potential for dust generation. Vehicles delivering material with dust potential to an off-site location shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust. Access gates to be located at least 10m from receptors where possible.

Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads. Public roads outside the site shall be regularly inspected for cleanliness, and cleaned as necessary. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. Record should be kept of all inspections of the haul routes and any subsequent action in a site log book.

Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind. Sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place. Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods, activities such as scabbling should be avoided. Bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.

At all times, the procedures put in place will be strictly monitored and assessed by the contractor. In the event of dust nuisance occurring outside the site boundary, satisfactory procedures will be implemented to rectify the problem. Dust monitoring should be put in place to ensure dust mitigation measures are controlling emissions. Dust monitoring should be conducted using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/(m^2*day) during the monitoring period between 28-32 days.

The Dust Minimisation Plan shall be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. The name and contact details of a person to contact regarding air quality and dust issues should be displayed on the site boundary, this notice board should also include head/regional office contact details. Community engagement before works commence on site should be put in place, including a communications plan. All dust and air quality complaints should be recorded and causes identified, along with the measures taken to reduce emissions. This complaints log should be available for viewing by the local authority, if requested. Daily on and off site inspections should occur for nuisance dust and compliance with the dust management plan. This should include regular dust soiling checks of surfaces such as street furniture, windows, and cars within 100m of the site boundary. Cleaning should be provided if necessary.

9.0 CHAPTER 9 NOISE AND VIBRATION

9.1 Introduction

This chapter, prepared by AWN Consulting, presents an assessment of the impacts of proposed development in terms of Noise and Vibration.

The chapter and assessment has been completed having regard to the guidance outlined in the Environmental Protection Agency's *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (Draft, September 2017) and *Advice Notes for Preparing Environmental Impact Statements* (Draft, September 2015).

The following methodology has been adopted for this assessment:

- Identify appropriate noise/vibration criteria for the site;
- Carry out baseline monitoring at a number of critical locations (e.g. in the vicinity of nearest sensitive properties) to identify existing levels of noise in the vicinity of the development;
- Undertake calculations to predict levels of noise during the construction and operational phases of the development; and,
- Comment on predicted levels against the appropriate criteria and outline required mitigation measures (if any).

In the first instance it is considered appropriate to review some basic fundamentals of noise and vibration.

9.1.1 Fundamentals of Acoustics

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

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

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

An indication of the level of some common sounds on the dBA scale is presented in Figure 9.1, which shows a quiet bedroom at around 35 dBA, a nearby noisy Heavy Goods Vehicle at 7 m at 90 dBA and a pneumatic drill at 7m at about 100 dBA.

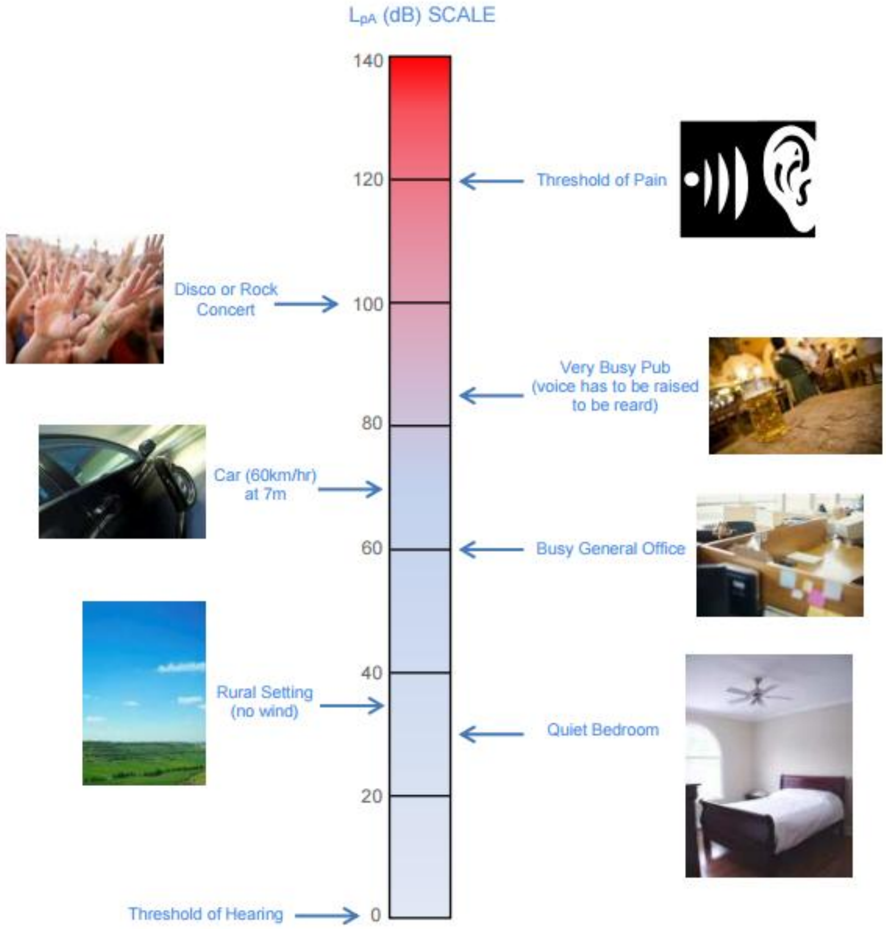

Figure 9.1 Typical Common Sounds on the dBA Scale (Environmental Protection Agency)

9.1.2 Fundamentals of Vibration

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity.

Peak Particle Velocity is defined in British Standard *BS 5228-1:2009+A1:2014 - Code of Practice for Noise and Vibration Control on Construction and Open sites – Vibration* as the:

> *"Instantaneous maximum velocity reached by a vibrating element as it oscillates about its rest position."*

The unit of measurement of Peak Particle Velocity is most commonly millimetres per second, mm/s. However, when dealing with human perception to vibration and the tolerances of sensitive equipment the unit of measurement of micrometres per second, µm/s, may be used. It is also important to take account the frequency at which the vibration occurs, which similar to sound is expressed in Hertz (Hz). Buildings are sensitive to vibration at very low frequencies, i.e. less than 10Hz, and are more resistant to vibration at higher frequencies, i.e. above 50Hz.

It is acknowledged, however, that humans are sensitive to vibration stimuli at much lower magnitudes than those likely to cause damage to buildings. Vibration typically becomes perceptible at around 150 to 300µm/s PPV and may become disturbing or annoying at higher magnitudes. However, higher levels of vibration are typically tolerated for single events or events of short-term duration, particularly during construction projects and when the origin of vibration is known.

9.2 Methodology

9.2.1 Construction Phase Assessment Criteria

9.2.1.1 Noise

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project.

In the absence of specific local guidance, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the British Standard *BS5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Noise*.

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

This document sets out guidance on permissible noise levels relative to the existing noise environment. Table 9.1 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors as recommended by *BS5228-1:2009+A1:2014*.

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A[1]	Category B[2]	Category C[3]
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
Evenings and weekends[4]	55	60	65
Night-time (23:00 to 07:00hrs)	45	50	55

Table 9.1 Example threshold of significant effect at dwellings

It should be noted that this assessment method is only valid for residential properties.

For the appropriate periods (i.e. daytime, evening and night time) the ambient noise level is determined and rounded to the nearest 5dB. Baseline monitoring carried out as part of this assessment would indicate that the categories detailed in Table 9.2 are appropriate in terms of the nearest noise sensitive receptors being considered in this instance. On occasion construction works may continue into the evening, however as these works would be subject to prior approval by the planning authority, only the normal proposed daytime periods of operation are referenced.

1 Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
2 Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
3 Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.
4 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

Period	Location	Rounded Baseline Noise Level L_{Aeq} (dB)	Category	Proposed Noise Limit $L_{Aeq,1hr}$ (dB)
Weekdays (08:00 – 18:00) and Saturdays (08:00 – 13:00)	S01	50	A	65
	S02	55	A	65
	S03	50	A	65

Table 9.2 Rounded Baseline Noise Levels and Associated Categories

If the construction noise level exceeds the appropriate category value, then a significant effect is deemed to occur.

9.2.1.2 Vibration

Vibration standards are generally split into two categories, those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- *British Standard BS 7385-2:1993 - Evaluation and Measurement for Vibration in Buildings - Guide to Damage Levels from Ground Borne Vibration*, and;
- *British Standard BS 5228-2:2009+A1:2014 - Code of Practice for Noise and Vibration Control on Construction and Open Sites – Vibration*.

BS7385-2:1993 states that there should typically be no cosmetic damage if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.

BS5228-1:2009+A1:2014 recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above. Below these values minor damage is unlikely. Where continuous vibration is such as to give rise to dynamic magnification due to resonance, the guide values may need to be reduced by up to 50%. *BS 5228-2:2009+A1:2014* also comments that important buildings which are difficult to repair might require special consideration on a case by case basis.

9.2.2 Operational Phase Assessment Criteria

Due consideration must be given to the nature of the primary noise sources when setting criteria. Criteria for noise from these sources, with the exception of additional vehicular traffic on public roads, will be set in terms of the $L_{Aeq,T}$parameter (the equivalent continuous sound level).

Given that vehicle movements on public roads are assessed using a different parameter (the ten percentile noise level; L_{A10}), it is appropriate to consider the increase in traffic noise level that arises as a result of vehicular movements associated with the development in terms of the L_{A10} parameter.

9.2.2.1 Noise Levels Generally

The standard, *BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings*, sets out recommended internal noise levels for several different building types from external noise sources. The guidance is primarily for use by designers and hence *BS 8233:2014* may be used as the basis for an appropriate schedule of noise control measures. The recommended indoor ambient noise levels for residential dwellings are set out in Table 9.3.

Activity	Location	Day 07:00 to 23:00hrs dB $L_{Aeq,16hour}$	Night 23:00 to 07:00hrs dB $L_{Aeq,8hour}$
Resting	Living room	35	-
Dining	Dining room/area	40	-
Sleeping (daytime resting)	Bedroom	35	30

Table 9.3 Indoor ambient noise levels for dwellings from BS8233: 2014

For the purposes of this study, it is appropriate to derive external assessment criteria based on the internal criteria noted in the paragraph above. This is done by factoring in the degree of noise reduction afforded by a partially open window. This is nominally deemed to fall in the range of 15dB[5].

Based on the guidance outlined the *BS8233:2014* standard and cognisant of prevailing background noise levels, the following external noise levels would be considered reasonable in order to achieve suitable internal noise levels within the nearest residential properties:

- Daytime(07:00 to 23:00 hours)55dB $L_{Aeq,15minute}$;and,
- Night (23:00 to 07:00 hours) 45dB $L_{Aeq,15minute}$.

9.2.2.2 Plant Noise Levels

Guidance on noise emissions from mechanical plant items has been taken from *British Standard BS4142:2014: Methods for Rating and Assessing Industrial and CommercialSound*. This document is the industry standard method for analysing building services plant sound emissions to residential receptors.

*BS4142:2014*describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

For an appropriate*BS4142:2014*assessment it is necessary to compare the measured external background sound level (i.e. the $L_{A90,T}$ level measured in the absence of plant items) to the rating level ($L_{Ar,T}$) of the plant items, when operational.

5 Ref BS 8233 *'If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB'.*

Where sound emissions are found to be tonal, impulsive, intermittent or to have other sound characteristics that are readily distinctive against the residual acoustic environment, *BS4142:2014*advises that penalties be applied to the specific level to arrive at the rating level.

In order to establish an initial estimate of impact, *BS4142:2014*states the following:

> *Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level, and consider the following.*
>
> a) *Typically, the greater this difference, the greater the magnitude of the impact.*
> b) *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
> c) *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
> d) *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*

Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

The assessment methodology described above (i.e. comparison of rated sound level to background sound level) is quoted in *BS4142:2014*as representing a methodology to 'obtain an initial estimate' of impact. It is important to note that *BS4142:2014*also comments that '*Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration'*.

Based on the measured noise levels as outlined in Section 9.4,in order to provide for the protection of amenity during the night time period, it will be necessary to limit plant noise to 41dB $L_{Aeq,15minute}$at the façade of the nearest noise sensitive receptor.

9.2.2.3 Additional Road Traffic Noise

In order to assist with the interpretation of the noise associated with vehicular traffic on public roads, Table 9.4 offers guidance as to the likely impact associated with any particular change in traffic noise level.

Change in Sound Level (dB L_{A10})	Subjective Reaction	Impact
< 3	Inaudible	Imperceptible
3 - 5	Perceptible	Slight
6 - 10	Up to a doubling of loudness	Moderate
11 - 15	Over a doubling of loudness	Significant
> 15		Profound

Table 9.4 Likely impact associated with change in traffic noise level

9.2.2.4 Operational PhaseVibration

No significant sources of vibration are expected to arise during the operational phase of the development. Operational vibration has therefore not been addressed further in this chapter.

9.3 Receiving Environment

9.3.1 Survey Details

An environmental noise survey was conducted in order to quantify the existing noise environment. The survey was conducted in general accordance with *ISO 1996-2:2007*
Acoustics -Description, Measurement and Assessment of Environmental Noise - Determination of Environmental Noise Levels[6]. Specific details are set out in the following sections.

9.3.2 Choice of Measurement Locations

Three survey locations were selected to determine the prevailing noise climate in the vicinity of the proposed development. An additional survey location was also required to establish the potential rail noise level incident to the proposed development. All survey locations have been presented in Figure 9.2 and discussed in the following sections.

Figure 9.2 Proposed Site Plan Indicating Noise Survey Locations

9.3.3 Survey Periods and Procedure

Survey Locations S01, S02 and S03

Attended noise measurements were conducted at Locations S01, S02 and S03 over the daytime between 11:59hrs and 15:24hrs on 29 September 2016.

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6 Although this standard has been replaced with ISO 1996-2:2017 *Acoustics -- Description, Measurement and Assessment of Environmental Noise - Determination of Sound Pressure Levels*, it was current at the time of the survey.

The daytime measurements cover a period that was selected in order to provide a typical snapshot of the existing noise climate, with the primary purpose being to ensure that the proposed noise criteria associated with the development during the construction phase are commensurate with the prevailing environment. The microphone was positioned at a height of 1.5metres which is representative of typical ground floor window level.

Survey Location SEL01

Unattended noise measurements were conducted at Location SEL01 between 12:10hrs on 8 February 2017 and 15:10hrs on 9 February 2017.

The microphone was positioned at a height of 4metres which is representative of typical first floor window level.

9.3.4 Personnel and Instrumentation

Gavin Blunnie (AWN) performed the measurements during the survey periods at S01, S02 and S03. Measurements were made using a Larson Davis LD831 Sound Level Meter. Sample periods were 15-minute for the attended monitoring.

Mark Glynn (Enfonic Ltd.) performed the measurements during the survey periods at SEL01. Measurements were made using a Brüel & Kjær Type 2250 Sound Level Meter. Sample periods were 1 second for the unattended monitoring.

Before and after the survey the measurement instruments were calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator. The instrumentation used in conducting the noise surveys has been referenced in Table 9.5.

Equipment	Survey Location	Type	Serial Number
Sound Level Meter	S01, S02, S03	Larson Davis LD831	2823
Sound Level Meter	SEL01	Brüel & Kjær 2250	3001734
Sound Calibrator	All	Brüel & Kjær	2205805

Table 9.5 Instrumentation Details

9.3.5 Measurement Parameters

The noise survey results are presented in terms of the following parameters:

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

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

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

L_{Ax} Sound Exposure Level is the total noise energy produced from a single noise event.

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

9.3.6 Meteorological Conditions

The weather during the attended daytime survey period was dry and calm with wind <3ms and temperatures ranging from 15 to 16°C.

The weather during the attended SEL survey period was dry and calm with wind <3ms and temperatures ranging from 6 to 7°C.

9.3.7 Results and Discussion

Location S01

The survey results for Location S01 are summarised in Table 9.6.

Time	Sound Pressure Level (dB re 2x10^{-5} Pa)		
	L_{Aeq}	L_{A10}	L_{A90}
11:59 - 12:14	53	56	49
13:09 - 13:24	52	55	48
14:12 - 14:27	54	54	48

Table 9.6 Summary of Measured Noise Levels at Location S01

During the survey period, the dominant intermittent noise source was intermittent rail activity including train sound horns on entry to Wexford town. Other sources of intermittent noise included birdsong and foliage noise from nearby trees.

Location S02

The survey results for Location S02 are summarised in Table 9.7.

Time	Sound Pressure Level (dB re 2x10^{-5} Pa)		
	L_{Aeq}	L_{A10}	L_{A90}
12:23 - 12:38	56	60	41
13:32 - 13:47	56	60	42
14:35 - 14:50	57	61	44

Table 9.7 Summary of Measured Noise Levels at Location S02

During the daytime survey period, the dominant intermittent noise source was road traffic noise on the nearby R730 road. Other sources intermittent noise included distant construction noise, dog barking within the housing estate and birdsong.

Location S03

The survey results for Location S03 are summarised in Table 9.8.

Time	Sound Pressure Level (dB re 2x10^{-5} Pa)		
	L_{Aeq}	L_{A10}	L_{A90}
12:44 - 12:59	54	53	44
13:50 - 14:05	48	48	43
14:54 - 15:09	52	51	42

Table 9.8 Summary of Measured Noise Levels at Location S03

During the survey period, the dominant intermittent noise source was intermittent traffic on the local road access to the GAA grounds. Other sources of intermittent noise included construction noise, birdsong and shouting and voices from the GAA pitch.

Location SEL01

The survey results for Location SEL01 are summarised in Table 9.9.

Period	Sound Pressure Level (dB re 2x10^{-5} Pa)		
	L_{Aeq}	L_{A10}	L_{A90}
Day (07:00 to 19:00hrs)	49	47	43
Evening (19:00 to 23:00hrs)	51	45	41
Night (23:00 to 07:00hrs)	45	42	37

Table 9.9 Summary of Measured Noise Levels at Location SEL01

During the survey period, the dominant intermittent noise source was rail traffic on the nearby tracks. Other sources of intermittent noise included birdsong trees rustling in the wind.

It must be noted that evening time L_{Aeq} is higher than the measured daytime L_{Aeq} due to the frequency of rail events during this period (4 no. over 4 hours during the evening against 2 no. over9 no. hours during the daytime).

9.4 Characteristics Of The Proposed Development

The proposed development consists of a mixed-use development. The proposal will involve the development of a range of residential units including houses, duplexes and apartments.

During the construction phase the main site activities will include extensive site clearance and excavation across the site and the construction of a range of houses and apartments blocks.This phase will involve the use various mobile plant, excavators, cranes, and other standard construction machinery throughout most of the site. This impact is considered relatively short-term in nature and is assessed in Section 9.6.2 and 9.7.1.

During the operational phase of the development, the potential noise sources are associated with operational plant items and changes to traffic flow. Outward impacts will be considered for both noise sensitive buildings external to the site in addition to those proposed as part of the new development. In addition, the inward noise impact of rail traffic will also be considered.

9.5 Potential Impact of the Proposed Development

9.5.1 Noise Sensitive Receptors

In the first instance, it is important to make reference to the nearest noise sensitive receptors to the proposed development.

The nearest noise sensitive receptors to the site boundary are dwelling houses located approximately 200metresto the south of the site. Elsewhere, receptors are located along the R730 to the south and southeast. Further consideration of noise levels arising across the bay to the east of the south. Receptors considered as part of this assessment have been presented in Figure 9.3.

Figure 9.3 Nearest Noise Sensitive Receptors

9.5.2 Construction Phase – Noise

It is predicted that the construction programme will create typical construction activity related noise onsite. It is AWN's understanding that the proposed hours of construction are 08:00 to 18:00hrs Monday to Friday and 08:00 to 13:00hrs on Saturdays.

Due to the nature of daytime activities undertaken on a construction site of this nature, there is potential for generation of elevated noise levels offsite. The potential for vibration at neighbouring sensitive locations during construction is typically limited to demolition and excavation works.

A list of typical plant items has been drawn up for each phase of the construction period. Assuming typical noise levels using guidance set out in BS 5228-1:2009+A1:2014 it is possible to predict construction noise levels at the nearest noise sensitive receptors arising during each phase of the construction period. Table 9.10 outlines typical plant items and associated noise levels that are anticipated for various phases of the construction programme. The noise levels outlined in Table 9.10 relate to those quoted at 10m reference distance in *BS 5228-1:2009+A1:2014* and typically relate to noise levels without the consideration of construction noise mitigation.

Phase of Works	Item of Plant (BS 5228-1:2009+A1:2014 Ref.)	Construction Noise Level at 10m Distance (dB $L_{Aeq(1hour)}$)
Site Preparation	Track Excavator (C2 22)	72
	Large rotary bored piling rig (C3.14)	83
	Dozer (C2.13)	78
	Dump Truck (C4.2)	78

Foundations	Tracked Excavator (C3.24)	74
	Concrete Pump (C3.25)	78
	Compressor (D7 6)	77
	Poker Vibrator (C4 33)	78
General Construction	Hand tools	81
	Pneumatic Circular Saw (D7.79)	75
	Internal fit – out	70
Landscaping	Dozer (C2.13)	78
	Dump Truck (C4.2)	78
	Surfacing (D8.25)	68

Table 9.10 Typical Noise Levels Associated with Construction Plant Items

Predictions have been presented for construction works for each phase of the proposed development at the nearest residential receptor located approximately 200metres to the south of the site. The levels of noise generation for each activity have been estimated and presented in Table 9.11 and a working distance of 200metres.

Phase	Predicted Construction Noise Level (dB $L_{Aeq(1hour)}$)	Daytime Construction Noise Criteria (dB $L_{Aeq(1hour)}$)	Complies?
Site Preparation	49	65	Y
Foundations	45		Y
General Construction	47		Y
Landscaping	46		Y

Table 9.11 Predicted Noise Levels at the nearest Noise Sensitive Receptor

It must be noted that predictions are based on the cumulative impact of all plant items listed in Table 9.10 for each phase where there is a utilisation of plant for 66% of a working day. No screening has been assumed in the calculations.

The predicted noise levels from all works are within the criterion of 65dB $L_{Aeq,1hr}$ at the nearest receptor. Given that these noise levels constitute worst-case conditions with the listed construction activities all being conducted at the closest point within the construction site to the nearest noise sensitive location, actual construction noise level emission will likely be lower than the levels listed above as there will be a greater separation distance between the construction works and the noise sensitive receptors.

Nevertheless, all construction works will be undertaken in accordance with the mitigation measures outlined in Section 9.7.1.

9.5.3 Construction Phase – Vibration

The main potential source of vibration during the construction programme is associated with piling, demolition and ground breaking activities, where required. In terms of piling, low vibration methods involving bored piles will be used in order to minimise vibration levels from this activity. Reference to *BS 5228-2:2009+A1:2014*, includes measured vibration levels during rotary bored piling for different ground conditions and varying pile diameter. The data indicates that at distances of

10metres, measured PPV values are typically below 1mm/s with individual events during driving casing or auger hitting rock at or below 3mm/s.

Considering the of low vibration levels at close distances to the piling rigs, vibration levels are not expected to pose any significance in terms of cosmetic or structural damage to any of the buildings adjacent to the development. In addition, the range of vibration levels is typically below a level which would cause any disturbance to occupants of adjacent buildings.

Where rock breaking is required, there is also potential for vibration to be generated through the ground. Empirical data for these activities is not provided in the *BS 5228-2:2009+A1:2014* standard, however the likely levels of vibration are expected to be significantly below the lower adopted criteria for building damage on experience from other sites. Notwithstanding the above, any construction activities undertaken on the site will be required to operate below the recommended vibration criteria set out in Section 9.2.1.

9.5.4 Operational Phase - Additional Road Traffic on Public Roads

Reference has also been made to the content of the NRB Consulting Traffic & Transport Assessment Report to determine the predicted change in noise levels on the surrounding road network by the proposed development during the design year of 2035 (opening year + 15) which is considered to be a worst case as it assumes all phases of the development will be constructed.

For the purposes of assessing potential noise impact, it is appropriate to consider the relative increase in noise level associated with traffic movements with and without the development using the provided peak movements in addition to the overall Annual Average Daily Traffic (ADDT) data. For reference the calculated increase in road traffic noise for each scenario has been presented in Table 9.12 for each of the main roads to experience road traffic increases as a result of the proposed development.

Road	Design Year 2033 AADT		Development Traffic	% Increase	Change in Noise Level (dB L_{A10})
	Do Minimum	Do Something			
To Wexford Hospital	4,781	5,350	569	12%	0
Old Hospital Road to Wexford	2,506	2,765	259	10%	0
Old Hospital Road from Wexford	1,013	1,110	98	10%	0
Local access road	1,313	1,655	343	26%	1
R730 to Wexford	5,600	6,820	1,220	22%	1
R730 from Wexford	4,894	5,735	841	17%	1
Site Access	481	2,440	1,959	407%	7

Table 9.12 Predicted Road Traffic Noise Increase for Main Roads

Reference to Table 9.4 would indicate that in the majority of cases, the potential increase in road traffic noise levels associated with the proposed development would be inaudible and the resultant impact imperceptible. In the case of the site access road, due to the low levels of existing traffic, the relative increase in noise levels would be 7 dB. It is important to note that the location of the nearest receptor to the access road is such that this receptor is actually closer to the existing R730.

It is therefore prudent to examine the potential cumulative impact of additional road traffic on this receptor. Table 9.13 highlights the predicted road traffic noise levels, taking into account propagation due to distance at the nearest noise sensitive receptor.

Road	Predicted Road Traffic Noise Level (dB L_{den})		Variation dB
	DM 2033	DS 2033	
R730 to N11	69	70	<1
Site Access	57	64	6
Cumulative	70	71	<1

Table 9.13 Predicted Road Traffic Noise Increase – Access Road

It is noted that although there will be 6dB increase due to the site access, the level of noise arising from the existing R730 is such that the cumulative increase in noise levels will be of the order of 1dB, reference to Table 9.4 would indicate therefore that the impacts of additional road traffic noise would therefore be negligible.

9.5.5 Operational Phase - Building Services

Once a development of this nature becomes fully operational, a variety of mechanical plant will be required to service the proposed retail spaces and apartment blocks. The plant items likely to be required in instance include amongst others, the following:

- Air handling units (including extract and supply duct terminations);
- Condenser fan units; and
- Chillers for retail refrigeration.

Where such plant is required for chilling, it would be necessary that this plant would be required to operate 24 hours a day, and hence would be most noticeable during quiet periods (i.e. night).

In this instance the typical prevailing background noise in the vicinity of the nearest sensitive receptors fell in the range of 37dB L_{A90} during the night-time period. Therefore, in order to limit the noise impact of mechanical plant serving the proposed development, during the detailed design of the development the specific plant noise levels will be designed to be equal or lower to 41dB $L_{Aeq,T}$at the façade of the nearest residential noise sensitive location.

Potential measures to aid in the achievement of this limit have been included in Section 9.7 for reference.

9.5.6 Operational Phase - Inward Noise Impacts

In addition to the outward impacts of the proposed development, it is prudent to examine the potential inward noise arising from existing noise sources, in particular the railway track located to the west of the development.

The nearest proposed dwellings will be located at approximately 10meters distance from the trackside. In order to determine the worst case potential noise level from rail traffic, site specific measurements of various rail movements were undertaken. The measured Sound Exposure Level (L_{AX}) for Diesel Motive Units (DMU) in use on the adjacent line falls in the range of 93dB L_{AX}[7].

[7] At a distance of 4m

Using this SEL and it is possible to predict the expected noise levels arising at the façade of the nearest noise sensitive receptor using the following equation:

$$L_{Aeq} = L_{AX} – 10 \log (r_1/r_2) + 10 \log (N) – 10 \log (T)$$

Where:

L_{Ax}	measured SEL
N	number of vehicle movements
T	time (seconds)
r_1	distance from the source to the receiver
r_2	distance from the source to the measurement

A review of Iarnród Éireann timetables would suggest that the worst case hourly traffic would occur within the period of 18:22hrs to 19:05hrs whereby 2 no. DMU pass bys would occur. This level of rail traffic would be expected to give rise to a resultant noise level of the order of 52dB $L_{Aeq,1hour}$ at the façade of the nearest proposed dwelling. This level would achieve the daytime design goal of 55dB $L_{Aeq,T}$as outlined in Section 9.3.1.

The current Iarnród Éireann timetable for passenger services does not indicate any night time departures or arrivals. Similarly no freight train movements were measured during the night time period of the survey. However, in order to assess a worst case scenario, in the event that passenger or freight operations would occur during the night-time period, the following comment has been provided.

During the night-time we have assumed a hourly maximum of 1 no. DMU. This level of rail traffic would be expected to give rise to a resultant noise level of the order of 49dB $L_{Aeq,1hour}$ at the façade of the nearest proposed dwelling. This level is marginally in excess of the night-time design goal of 45dB $L_{Aeq,T}$as outlined in Section 9.3.1. As such additional noise mitigation measures are proposed in order to protect the proposed residential dwellings from railway noise intrusion.

9.6 Remedial Or Reductive Measures

9.6.1 Construction Phase

9.6.1.1 Construction Noise Management

The contractor will also be obliged to give due regard to *BS5228-1:2009+A1:2014*, which offers detailed guidance on the control of noise from construction activities. In particular, it is proposed that various practices be adopted during construction, including:

- Limiting the hours during which site activities likely to create high levels of noise are permitted.
- Establishing channels of communication between the contractor, local authority and residents.
- Appointing a site representative responsible for matters relating to noise.
- Monitoring typical levels of noise during critical periods and at sensitive locations.
- Furthermore, it is envisaged that a variety of practicable noise control measures will be employed in addition to the maintenance of the propped acoustic screen, including:
    - Selection of plant with low inherent potential for generation of noise; and

- Siting of noisy plant as far away from sensitive properties as permitted by site constraints.

9.6.1.2 Construction Noise and Vibration Management Plan

Due to the potential for construction noise impacts, it is recommended that the Contractor draw up and submit a Construction Noise and Vibration Management plan for submission to Wexford County Council.

This management plan should entail specific details of the procedures and measures that the contractor shall employ to ensure that noise limits outlined can be complied with.

9.6.1.3 Summary of Construction Noise Mitigation Measures

It is envisaged that once these mitigation measures are implemented that noise can be reduced to within the requisite noise limits as established in Section 9.2.1.

9.6.2 Operational Phase

9.6.2.1 Building Services Noise

All plant will be designed and installed to achieve a cumulative sound pressure level not exceeding 41dB $L_{Aeq,15minute}$ at the nearest noise sensitive receptors.

Where applicable, the following measures will be implemented as standard:

- All AHU's will be provided with requisite intake and exhaust attenuation;
- All condenser and chiller fans will be appropriately specified; and
- Acoustic screening will be installed where necessary.

9.6.2.2 Additional Road Traffic

The assessment has shown that no mitigation will be required in respect of additional road traffic on public roads.

9.6.2.3 Inward Noise Impacts

The assessment indicates that there may be some potential noiseimpactfrom rail operations. In order to reduce the level of rail noise within dwellings proposed along the southern boundary of the site, the following mitigation measures are proposed:

- The boundary wall running along the west of the site will be increased to 3.0metres height relative to the finished floor level of the nearest houses and apartments, and;
- Upgraded glazing and ventilation will be incorporated into the design for facades of dwellings incident to the rail line. Glazing offering sound insulation performance of at least 33dB R_w shall be fitted. Additionally through wall or in frame vents shall be selected to offer a sound insulation performance of 35dB $D_{n,e,w}$.

It is envisaged that once these measures are implemented that the level of rail noise incident to dwellings can be reduced to within the design goals outlined in Section 9.3.1.

9.7 Predicted Impact Of The Proposed Development

9.7.1 Construction Phase

During the construction phase of the proposed development there will be an increase in noise levels due to noise emissions from activity on-site. However, given that the construction phase of the development is temporary in nature, it is expected that the various noise sources will not be excessively intrusive. Furthermore, the application of binding noise limits and hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration impact is kept to a minimum.

9.7.2 Operational Phase

During the operational phase, potential causes of disturbance are considered to be limited to building services plant and additional vehicles on the existing road system. It has been predicted that with appropriate mitigation none of these will increase the existing noise climate sufficiently so as to be likely to cause disturbance.

9.7.3 Worst Case Scenario

The assessment of noise and vibration from the proposed development has identified that mitigation measures will be required during all stages of the construction phase. In relation to operational noise, mitigation measures will be provided as a matter of course in respect of building services noise. Otherwise, mitigation measures are not required for the operational phase of the development.

In the event that the mitigation measures as proposed are either not implemented or suffer catastrophic failure, it would be expected that noise and vibration in excess of the appropriate limits would be generated. Such noise could result in a deterioration of the nearby residential and onsite amenity.

It is important to note that failure of the proposed mitigation measures would not result in any profound or irreversible consequences in respect of noise and vibration.

9.8 Monitoring

Noise and vibration monitoring will be undertaken during the construction phase in accordance with the procedures and methodologies outlined in *BS 5228-1:2009+A1:2014* and *BS 5228-2:2009+A1:2014*.

On-going noise and vibration monitoring during the operational phase of the development is not required.

9.9 Reinstatement

Due to the scale of the site, reinstatement would require significant demolition and removal of material offsite. It would be expected that such operations would have the potential to generate noise and vibration impacts offsite.

10.0 Landscape and Visibility

10.1 Statement of Competency

Expert	Company	Aspect of Environment	Qualifications	Summary of professional expertise
Paul Nolan	Landscape design, planning & consultancy	Landscape Design, Arboriculture .	H.N.C. Hort. M.R.H.S	1986-1995 Manager of Pride Landscapes Ltd London uk. • Running landscape company dealing with Design and Build, bespoke • homes and commercial streetscapes • 1997-2014. • Director of A1 Garden design Ltd • Design & Build • Landscape consultant on planning submissions. • Visual impact assessments. • Tree surveys and Arboricultural reports in conjunction with Arborcare 2014-Present. • Design & Project Manager of Carragh Paving & Landscapes 2018- Present. • Director of Landscape Design & Planning Ltd – NI-UK
Cormac Langan		Landscape Architect	B.Sc. Land. Arch Agricultural Science, University College of Dublin	Landscape Architect Cormac is a Landscape Consultant in Westport. He has worked previously as a landscape consultant in Dublin, Limerick and Sydney. **Areas of Expertise:** • Bio-security for invasive species. Site vegetation surveys, management plans & methodologies • Project management • Procurement, tendering • Soft and hard landscape design expertise • EIAR, appropriate assessments, ecological reports, tree surveys;

10.2 Landscape & Visual Impact.

10.3 Introduction

This section of the EIAR appraises the existing landscape of the proposed development site, which is located at Carcur Park Wexford. It will then assess the likely landscape and visual impacts arising from the proposals, as viewed from selected visual receptors outside the site boundary. It will also describe the proposed landscape mitigation measures and the resulting residual landscape and visual impacts.

Paul Nolan -Landscape Design & Planning Consultant was commissioned to conduct a landscape and Visual assessment of the site and its environs. Project documents prepared by engineering consultants, architects, planning consultants were reviewed. Site visits were carried out in October 2016.

10.4 Methodology

Assessing the lands is about the sensitivity of the landscape and its ability to undergo change. The methodology is based on the national and local policy guidelines, current legislation and best practice methodology as outlined in the references below:

- *This Environmental Impact Assessment Report ("EIAR") has been carried out in accordance with "Revised Guidelines on the information to be contained in Environmental Impact*
  Statements Draft" and "Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)" published by the Environmental Protection Agency, Ireland in 2015 and 2003 respectfully. The requirements of Part X of the Planning and Development Act, 2000 (as amended) and Part 10 of the Planning and Development Regulations, 2001 (as amended) were also considered.
- *Department of Environment, Heritage and local Government (DoEHLG) guidelines on Landscape and Landscape Assessment.*
- *Irish Landscape Institute guidelines on Landscape and Visual Assessment.*

A landscape and visual assessment consists of two general aspects. The first being Visual Impact, which is the extent to which the new development and its landscape alterations can be seen. The second being Landscape Character Impact, which examines innate responses to the changes created by the proposed development. This assesses both natural and cultural criteria and is an amalgamation of the impacts on landform, ecology, noise, traffic, view sheds, historical and cultural elements.

The following maps were also consulted as part of a desktop review and as field references:

- 1:50000 OSI Discovery Series (Map)
- Ordnance Survey 6-inch maps
- Ordnance Survey 25-inch map

The assessment of Visual Impact is approached by first understanding the composition of the site (terrain, vegetation, structures and features) and the potential development parameters. In this instance, the proposed development programme is defined in terms of building heights, building materials, boundary relationships and the influence of the River Slaney. With these in mind, the near and greater environs are reviewed for their visual relationship to the site. This review includes visiting public roads, registered historical sites and structures, scenic routes and byways, areas of conservation, key areas of the town, public transport nodes, areas of special interest as identified in official policy guidelines, as well as adjacent lands in so far as they are accessible. This assessment results in a Zone of Visual Influence, identifying the context from where the site is physically visible. (Fig A)

The assessment of Landscape Character involves an attempt to scientifically measure feelings and perceptions of the site and its environs. Because character is difficult to scientifically define, extensive cross referencing is required to achieve an impartial assessment. Historical and contemporary documents see other references in this EIAR, the current site status, relationship to adjacent uses, as well as unwritten community perception of the site all play a role in defining landscape character. The criteria for measuring the impacts are outlined in tables 1.1 Potential Impacts.

Documents presented play a critical role in visual assessment and include a series of photomontages, which are rendered graphic examples of how the proposed design would look in the existing landscape. These typically take selected viewpoints (or receptors) from outside the site and compare the existing condition with a rendered version of the exact same view. Using existing landmarks and GPS positioning, the proposed structures and landscape are represented in the photomontage with accuracy. Ten view locations (receptors) were selected and are included in 10.11 Image Comparisons. As part of the methodology in this chapter, each view location was reviewed again upon completion of the photomontages. Written descriptions on the degree of sensitivity of each receptor are included.

10.5 Receiving Environment- Site Context

The proposed development site is encompassed within the lands designated Carcur park. The site occupies and Area of 13.36 ha and is bounded by the river Slaney to the north, south and east, with sports and amenity space to the west. The site is separated from these lands by the Rosslare -Dublin Rail Link which runs parallel to the western site boundary.

Under the Wexford development plan 2009-2015 the site is zoned for residential development. It is proposed that future development would facilitate a new river crossing linking Ardcavan and Carcur, providing an alternative traffic route to the town.

The site is assessed via an existing linkage road leading off the R730 Park road. The proposal denotes an extension to this road and the insertion of the “Railway Bridge crossing” to access the site.

To the south west lies a small cluster of private residences, with larger residential estates opposite the R720. Leading into further residential and commercial units on the approaches to Wexford town

Wexford is the home of several Historic and protected structures. Near the site lies the Heritage Park, situated within 1 Km of the site, to the North West. Carcur Park is not visible from the Heritage Park, but does come into view from the approach Road the N11.

10.6 Receiving Environment – Site

The proposed development site is encompassed within the lands designated Carcur park. The site occupies and Area of 13.36 Ha and is bounded by the river Slaney to the north, south and east.

The site is undeveloped and partly overgrown, vegetation is mainly scrubland, grasses with mixed woodland whips of Birch, Hawthorn, Ash, and is home to a wide variety of wildlife species. See ecology section for details.

10.7 Characteristics of the Proposal.

William Neville & Sons are seeking planning permission to develop the lands in Carcur Park to create a new residential area to accommodate the expansion and demand for residential units within the Wexford town area. Several new apartment blocks, with detached and semi-detached houses to be introduced at the location.

The Primary works include: -

1) Construction of main access roads.
2) Construction of Bridge to traverse the existing rail link.
3) Removal of Scrub and fencing off areas to be protected.
4) Earth moving grade and fill.
5) Permission is sought by Willian Neville and Sons for: A total of 413 residential units consisting of 175 houses (12 four bedroom detached houses + Garages, 20 four bedroom Semi-Detached houses, 2 four bedroom corner detached houses, 80 three bedroom Semi Detached Houses, 20 three bedroom terraced houses, 7 three bed end of terrace houses, 4 three bedroom corner houses, 20 two bedroom terraced houses, 6 two bedroom end of terrace, 4 Semi-Detached houses), 7 apartment blocks with a total of 238 Apartments: (Block One: (47 units over 5 floors: 40 two bed, 7 three bed), Block Two: (50 units over 7 floors: 4 one bed, 38 two bed, 8 three bed), Block Three: (45 units over 7 floors: 3 one bed, 34 two bed, 8 three bed), Block Four: (20 units over 4 floors: 1 one bed, 19 two bed), Block Five: (38 units over 5 floors: 1 one bed, 37 two bed,) Block Six: (19 units over 4 floors: 3 one bed, 15 two bed, 1 four bed) Block Seven: (19 units over 4 floors: 3 one bed, 15 two bed, 1 four bed)). Together with two crèche facilities (Crèche A: 346.4 sqm floor area. Crèche B 395. 3sq.m floor area). A total of 767 Car parking spaces (248 private parking spaces, 501 public spaces and 18 creche spaces). and all associated site works”. The proposal shall be delivered over four phases of development. An EIAR (Environmental Impact Assessment Report), an NIAR (NATURA Impact Assessment Report) and a SSFRA (Site Specific Flood Risk Assessment have been prepared as part of the planning application.

6) Installation of infrastructure, access roads, waste water treatment, new services to buildings and electrical supply.
7) Extensive landscaping is to be carried out to soften the development into the landscape, and to preserve and protect the existing wildlife habitat.

10.8 Potential Impacts

The methodology used to assess the impacts of the proposed development on the landscape is based on the terminology provided in the guidelines published by the Environmental Protection Agency, as outlined below.

Potential impacts are concerned with the likely and probable impacts of the proposed development. The impacts include those which are planned to take place and those which can be reasonably foreseen to be inevitable consequences of the construction and operation of the proposed development.

In determining potential impact, an understanding of the sensitivity of the site is necessary. A value is applied to the landscape resource and is based on the following Table 1.0. This is referred to as Landscape Sensitivity.

Table 1.0 - Landscape Sensitivity Values:

Sensitivity Level	Criteria
High	Exhibits a strong positive character with valued elements and is highly sensitive to change
Medium	Exhibits positive individual elements or positive general character, but is compromised by past or current use and is somewhat sensitive to change.
Low	Exhibits a character that is neutral or even negative, with few or no valued elements and is amenable to change.

A key measurement in assessing visual impact is the magnitude to which the change is perceived. The same element can impact visual receptors in very different ways because of proximity, receptor orientation and landscape context. Table 1.1 outlines the criteria for assessing this impact.

Table 1.1 - Landscape Significance Criteria

Level	Criteria
Imperceptible	An impact capable of measurement, but without noticeable consequences. No discernible deterioration or improvement in the existing view.
Slight	An impact which causes noticeable changes in the environment without affecting its sensitivities. The impact has been minimised by its scale or intervening topography and vegetation.
Moderate	An impact that alters the character of the environment as a result of changes to an appreciable segment of the view or intrusion in the foreground
Significant	An impact by which its character, magnitude, duration or intensity alters a sensitive aspect of the environment. Where a view is obstructed or so dominated by a proposed scheme that it becomes the focus of

	attention.
Profound	An impact on a view that removes all sensitive characteristics or completely obstructs or alters the view.

Table 1.3 - Criteria for Assessing the Type of Landscape Impact

Type of Impact	Criteria
Neutral	Represents a change that does not affect the quality of the environment.
Positive	Represents a change that improves the quality of the environment.
Negative	Represents a change that diminishes the quality of the environment.

Table 1.4 - Criteria for Assessing the Duration of Landscape Impact

Impact Duration	Timeframe
Temporary	lasting less than 1 year
Short Term	lasting between 1 and 7 years
Medium Term	lasting between 7 and 15 years
Long Term	lasting between 15 and 60 years
Long Term	in excess of 60 years

These ratings are further assessed by the Type of Impact, which may be viewed as Neutral, Positive or Negative and as outlined in Table 1.3 Impact level also takes into consideration the duration of the impact and is considered to be one of the following outlined in Table 1.4

Impacts are also assessed at various stages of the project. The construction stage works quite often have a negative visual impact to varying degrees, but these impacts are often temporary. Of greater concern are the impacts evident at operational stage.

Part of the methodology in assessing the potential visual impact of a proposed development is identification of the Zone of Visual Influence (ZVI), also known as the Visual Envelope. The ZVI is a containment zone from where the site is visible when taking into consideration the proposed development. The extents are quite often based on visibility of the site to or from a specific area or feature in the landscape. The visual envelope is greatly influenced by the topography and vegetation in the area. Site visibility typically diminishes as distance from the site increases. Figure (A) illustrates the extent of the Visual Envelope for the proposed development.

10.9 Predicted Impacts.

Do Nothing Scenario.

In the do-nothing Scenario, the site will continue to operate in its current state for a period. Appearance and landscape character in the area will remain unchanged in the short to medium term with the non-developed areas of the site remaining unchanged.

Predicted impact will relate on two fronts (a) The change of Character. (b) the change of use.

a) The change of character: The proposed development will see a change in the landscape character of the site. A green field site will become a residential entity with hard and soft landscape elements combining to change the perceived character of the area. This character change will be a significant impact change and permanent change. Clever design, material palette and extensive landscape will mitigate against this character change with the aim of blending the development into the surrounding landscape.
b) The change of use: the proposed development will see new residential units, with traffic both vehicle and pedestrian. It will bring more people into the area, increase social and economic activity, breathing new life into the area. The site, along with its infrastructure will be a natural expansion of Wexford town and the surrounding area.
 Local authority policy is to see town expansion into usable sites within the development zone, to discourage rural development where possible. This site presents itself as such a usable space, design and an awareness of the surrounding environment will be of fundamental importance in achieving the desired goals.

Landscape areas: The existing landscape character of the area will change The site will physically change access roads, houses, apartment blocks and landscape works will become permanent features.

In the short term, there will be a negative impact during the construction stage. This will be a temporary impact until the construction works are completed. Temporary impact being negative, short term being neutral, medium to long term being positive on the maturing of the landscape areas and the blending of the roads and units into the receiving environment**.**

Visual Impact.

Likely Impacts of the Proposal

The proposed development as described will impact in varying degrees upon two inter related aspects, namely the existing view and the perceived character of the area.

This site, which is in an urban area, will change in character from a wasteland area to a residential area. The existing land will be replaced with high quality residential units with front and back gardens, access roads and open space areas for recreation and play.

Potential impact mitigation measures will be designed into the landscape in a sympathetic way by utilising the existing landscape palette of the area, through native planting, and maintaining the existing hedgerows where possible. Extensive new landscaping will be carried out to protect and enhance the character of the site and the area

The proposed landscaping is based on the following criteria:

1. In-depth look at the site, its location, orientation, aspect and environment.
2. Topography
3. Existing vegetation on site.
4. Local tree and plant forms within the wider landscape.
5. Hard landscape features.

To this end a full list of attributes has been obtained through visits to site and the local area surrounds. Our plant selection is based on existing native trees and shrubs located in the area. We have retained all existing mature trees where possible and have made recommendations to deal with the preservation of the same.

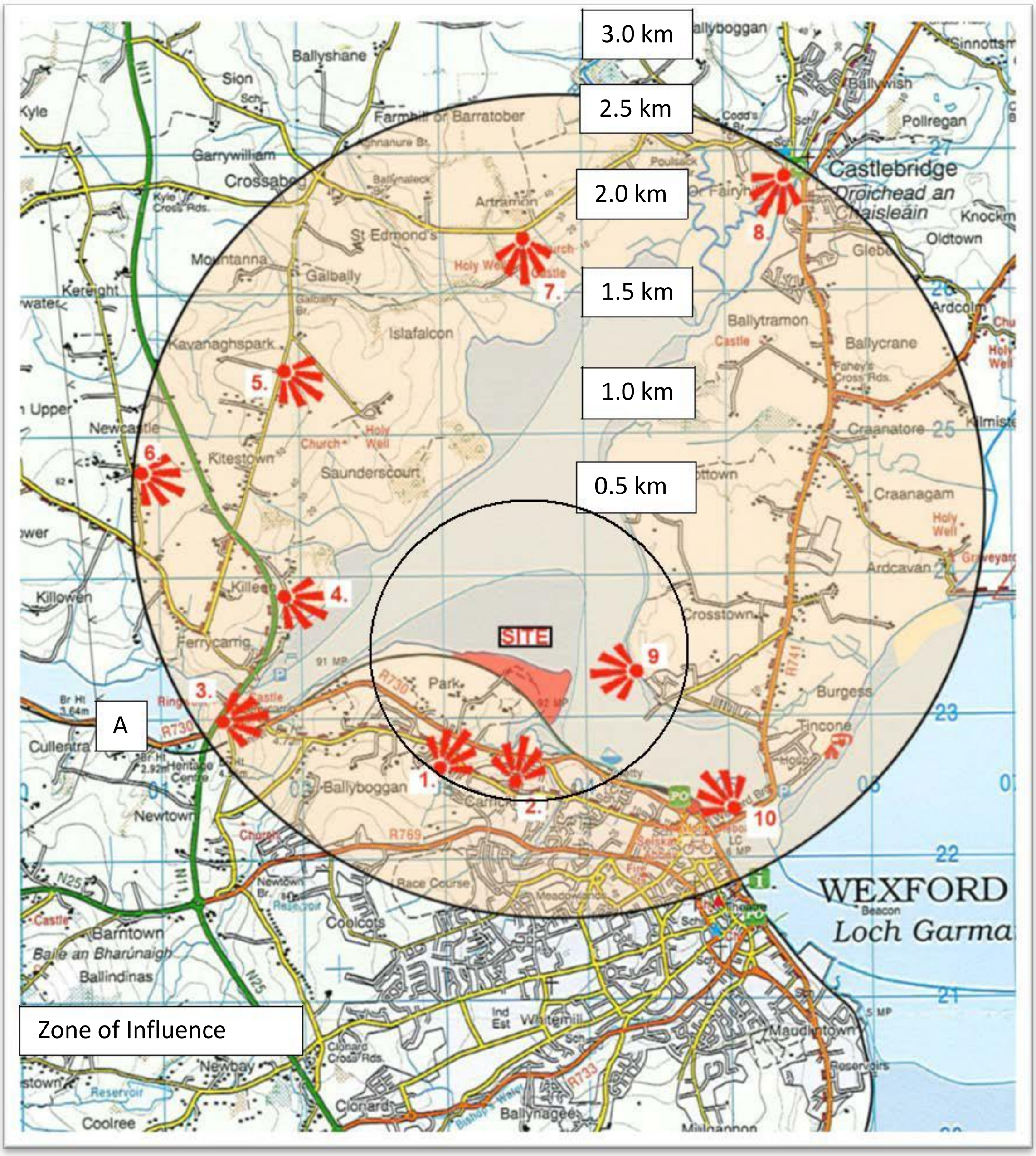
Our client is committed to carry out the required landscape works to ensure that the proposed Residential units merge into the local landscape and that the character of the area is maintained, enhanced and protected.

10.10 Impacts on Views:-

Table 1.5 - Summary of Viewpoint Position and Impact

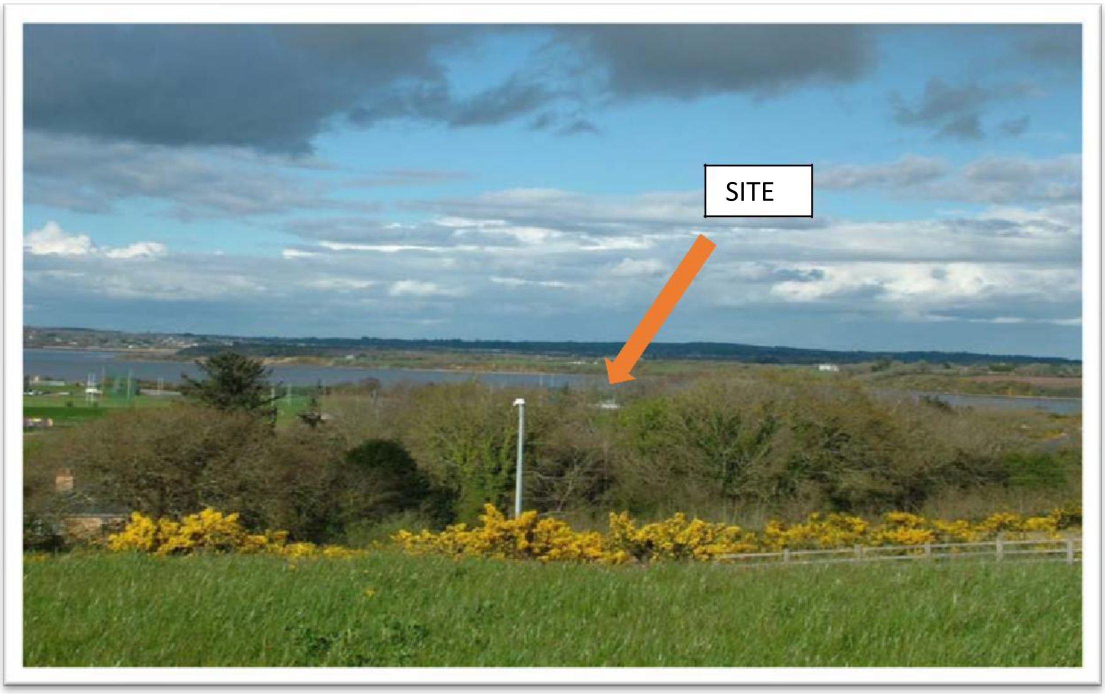
View No.	Viewpoint Position	Viewpoint Coordinates	Development Visibility
1	Carricklawn	52°20'39.91"N 6°29'18.17"W	North
2	Old hospital road	52°20'41.04"N 6°28'58.81"W	North
3	Ferrycarrig Bridge	52°21'4.61"N 6°30'37.16"W	East
4	Kavansaghspark	52°21'32.35"N 6°30'25.79"W	South east
5	N11 Ferrycarrig	52°22'8.75"N 6°30'22.60"W	South East
6	Kileen	52°21'31.15"N 6°30'42.28"W	South east
7	Artramon	52°22'55.62"N 6°28'29.79"W	South
8	Castlebridge	52°23'4.99"N 6°27'12.50"W	South
9	Crosstown Lane	52°21'0.30"N 6°28'2.23"W	West
10	Wexford Bridge	52°20'33.93"N 6°27'29.49"W	North west

Figure (A)


3.0 km
2.5 km
2.0 km
1.5 km
1.0 km
0.5 km
SITE
A
Zone of Influence
Castlebridge
WEXFORD
Loch Garma

View 1: Carricklawn.

This image was taken from the road curtilage outside the County Council offices viewing towards the site.



Carricklawn – Viewing North

The site is located along the river extending west behind the sports playing fields. Views from this elevated location take in the River Slaney estuary from Ferrycarrig to Wexford harbour.

The site is partly obscured from view by the existing vegetation and woodland adjacent to the railway line. The apartment blocks will be visible but will be softened by the backdrop in the greater vista.

Impacts during the construction phase will be Temporary and short term. Any tower Cranes will be visible from this vantage point. *Slight, Neutral*

Impact will be *Slight* in the short to medium term, and will remain *Slight -Neutral* in the long term.

View 2: Old Hospital Road and Parkview

This image was taken at the junction of the old Hospital road and the entrance into park view. The site is in the background and will be seen from this location.

Residents in this location have unobstructed view to Carcur, therefore any development will impact strongly on the existing landscape character.

Parkview consists of 27 No. residential units on two distinct levels. Properties further up the hill mainly Houses 22-27 and 1-6 will be impacted upon as their view will be changed permanently. Those lower will be less impacted upon as the topography and vegetation partly obscures views.

Impact will be *Moderate* in the medium to long term. *Negative*

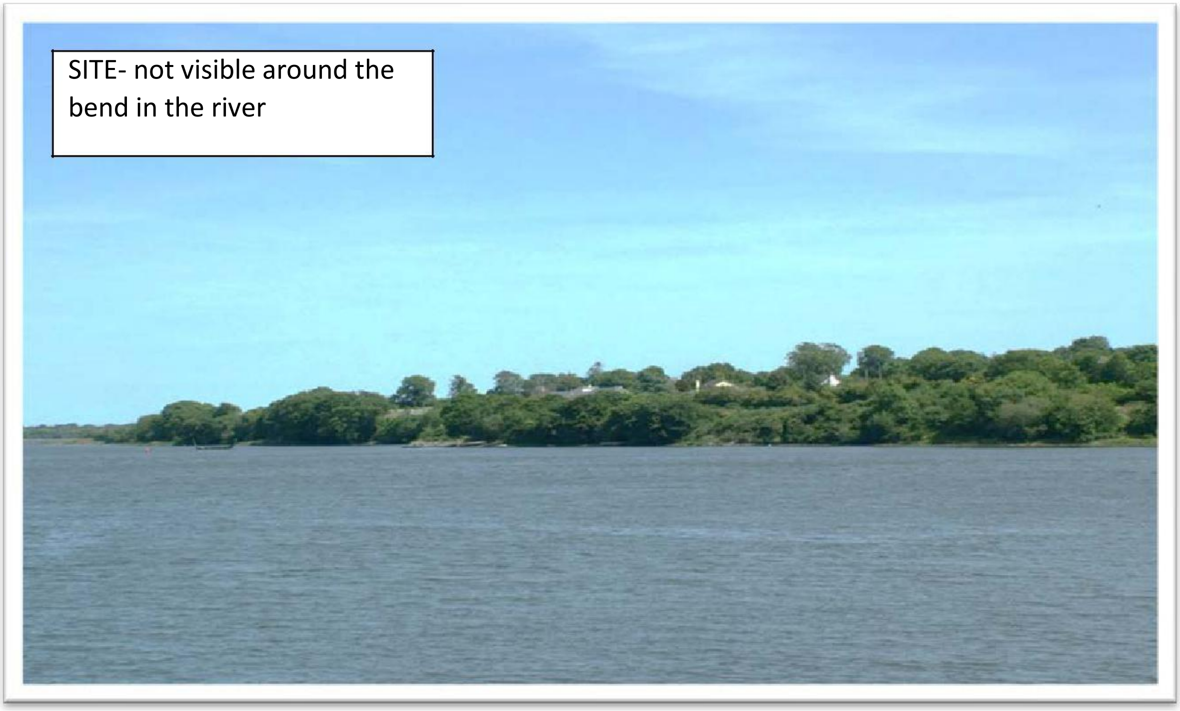
Parkview – Viewing East

View 3 : Ferrycarrig Bridge.

From this location, the proposed site is obscured from view by the natural bend in the river. The site and its proposed development will not be seen from this location.

The impact will be Short term and temporary during the construction phase.

Slight Imperceptible in the medium to long term. *Neutral*



View 4: Kavansaghspark

This Location is under the N 11 with extensive views down the Slaney estuary. There are unobstructed views into the site from this location. The apartment blocks will be visible from this location, partly obscure the remainder of the development, and the backdrop. The existing Birch woodland to the foreground is retained and will provide some natural screening obscuring a large section of the site.

Impact: During the construction phase the impact will be *Slight* on a temporary basis during the construction works.

In the medium to long term *Moderate* as the view will change permanently. *Neutral*

Long-term to permanent the impact will be *Moderate* as the existing tress mature and the landscape develops. *Slight*

N11 – Viewing South east

View 5: Ferrycarrig N 11

From this location, the full view of the site comes into view. These will be fleeting glances from vehicular traffic heading south on the N11. Pedestrians walking along the N11 will have unobstructed views into the site.

The site has Ardcavan as a backdrop with the "Riverbank Hotel" and "Ely House Hospital" in the back ground, both multi-storey buildings which blend into the background. The urban setting will accept the proposed buildings as an extension in the foreground of Wexford town. The new buildings will blend into this view softened by the existing mature trees adjacent to the site and in the foreground on the Ferrycarrig side of the Slaney.

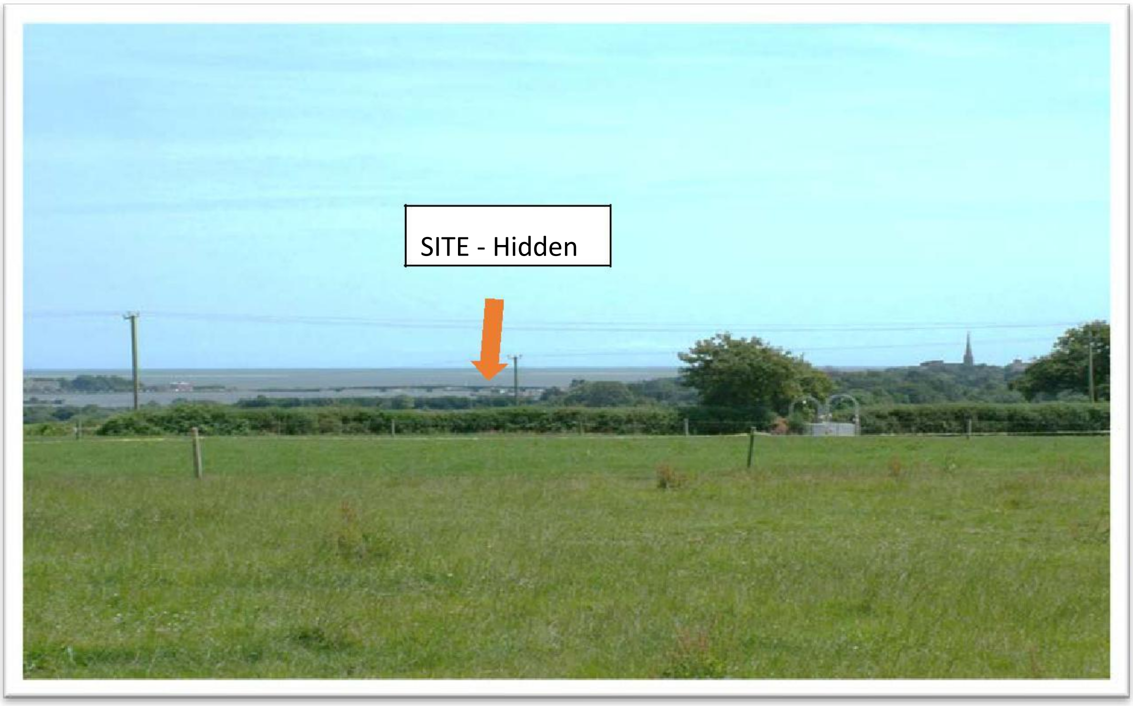
Impact will be *Moderate* during the construction stage, in the short term.

Moderate in the medium to long term- Permanent. *Slight*

View 6 : Kileen

From this location the site is located below the horizon and is screened by the existing topography. The elevated location looking over the estuary has a wide vista of Wexford harbour and the bridge in the distance, the site remains below the horizon level and obscured from view by the topography.

Impact: Imperceptible.



View 7: Antramon

Artramon House is located on the Crossabeg – Castlebridge road. The site is in the direct line of view from this location. At over 2Km the site is a distant view.

The existing view is dominated by the urban sprawl of Wexford town. The proposed development will add to the foreground of this view, but will not change the character of the view.

Impacts during the construction will be temporary. *Slight*

In the medium to long term the character won't change, *Neutral impact.*

Antramon – Viewing South

View 8 : Castlebridge

At 2.5km from the site Castlebridge lies at the extremities of the zone of Influence. There are views down the estuary towards the site, at 2.5km the views are distant and visual impacts are enough insignificant in the overall vista.

Impact: Imperceptible

View 9: Crosstown Lane.

This location is directly opposite the site on the Crosstown side of the River Slaney. Cross town lane runs perpendicular to the site, views to the site from the road are obscured by mature trees.

The site is seen from the stone beech located to the side of the Old bridge. There are a number of Residences with views out to the river who will be looking directly towards the site. A line of mature Cupressus macrocarpa are located to the rear of these properties, partly obscuring their view.

Impact: During the construction stage the impact will be moderate and temporary.

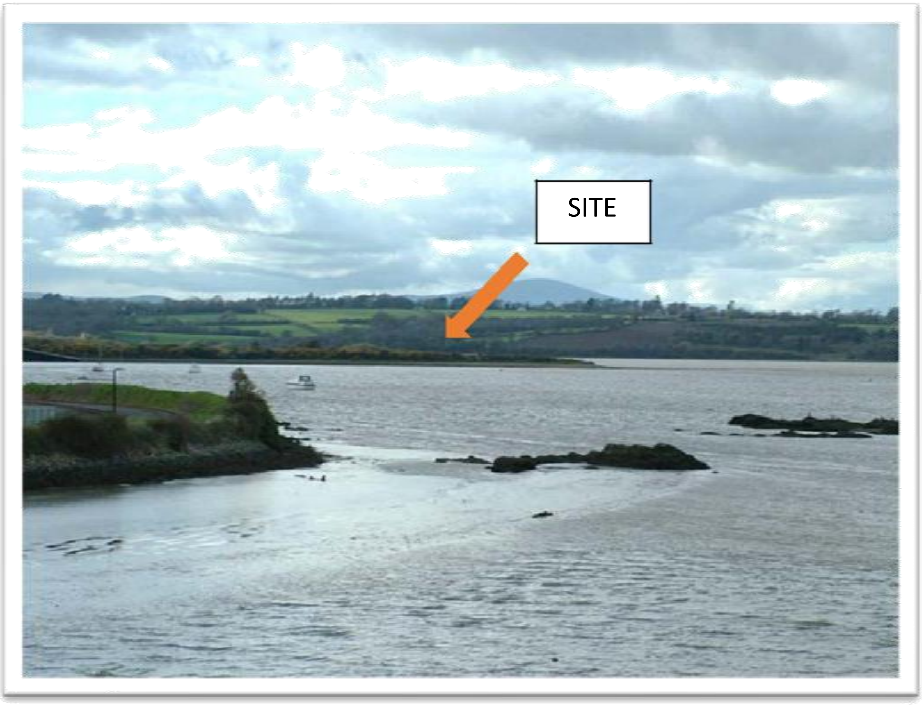
Slight In the medium to long term Moderate with a *Slight impact.*

Beach Head at Crosstown- Viewing West

View 10: Wexford Bridge.

In accessing the proposed visual impact from this view, it is better to compare both views from the bridge looking North to Carcur park and south down the Quay.

Views to the North show the location of the proposed new bridge and the undeveloped site.



Wexford Bridge- Viewing North

Views to the south show the development of Wexford as an urban centre.

There are numerous multi-storey buildings along the quay front, with the Cow and gate Industrial unit standing tallest in the back ground. There are many multi-storey buildings and apartment blocks located close to this structure, which can be seen in the foreground. As you come down the quay in Wexford towards the bridge Multi-storey units dominate the skyline.

Carcur development will provide a more open parkland site. A number of multi-storey apartment blocks will be located within two storey units. These units will be less visible than those on the southern side of Wexford. The existing topography and back drop will soften the taller buildings into the landscape.

If a bridge crossing is constructed then this will become the visually dominant structure with the taller buildings being obscured from view.

Impacts will be *Moderate* in the short to Medium term, *Slight* in the Long term, - Permanent

Construction Impacts

Construction of the development will add machinery, material depots, noise and dust to the landscape. But these will be Temporary impacts. Impacts of a temporary nature also draw attention to the works thereby increasing the visual disturbance experienced by users, resulting in a Moderate, Negative, Temporary impact.

6.8 Proposed Mitigation Measures

During the design and detailing stages of the project, consideration should be given on how to avoid any adverse impacts on views from the visual receptors. However, as with any development, some degree of impact is inevitable and, wherever possible, measures should be identified to mitigate the adverse nature of these impacts.

- Minimise visual and audible disturbances.
- Any identification signage to the site access should have low visual impact and minimal illumination.
- Site lighting should be minimised where possible and not exceed standard minimum operating requirements. Light fixtures should be unidirectional or have shields to minimise light pollution and should preferably incorporate energy efficient lamps.
- Planting adjacent to the Slaney River should consist solely of native plant species.
- Screen Planting to the site should be designed in tandem with the Flora and fauna, and ecology report.

6.9 Residual Impacts.

This development introduces new structures that alter the landscape character of the area, they become a permanent part of the landscape.

It can also be ascertained that this development allows for the expansion of Wexford town northwards creating a high quality residential area, with parkland and the bases for new bridge and expansion across the river linking Ardcavan and Crosstown to Wexford

Mitigation measures through the preservation of existing vegetation, in the Natura area, in combination with the extensive woodland adjacent to the site, and extensive tree and hedge planting on site will reduce the visual impact softening the development into the landscape. The choice of material colour and pallet of the building materials will contribute to the blending of the taller buildings into the landscape.

SUMMARY AND CONCLUSIONS

The proposed development will give rise to visual impact on the landscape character of the area. These impacts are by and large localised to certain viewpoints, partly due to the rural / sub urban environment that surrounds the site. There will be a change in character to the site and the immediate area.

In accessing the Zone of Influence many of the receptors have minimal impacts, Views directly to the site, are softened by the topography, existing vegetation and backdrop, which help mitigate against visual impact. Those views that are Moderate offer fleeting glances. Mitigation measures will help soften these impacts over time, as vegetation and planting matures, and the buildings settle into the landscape.

Distant Views will be Slight to Imperceptible and be generally neutral in effect.

10.11 Image Comparisons.

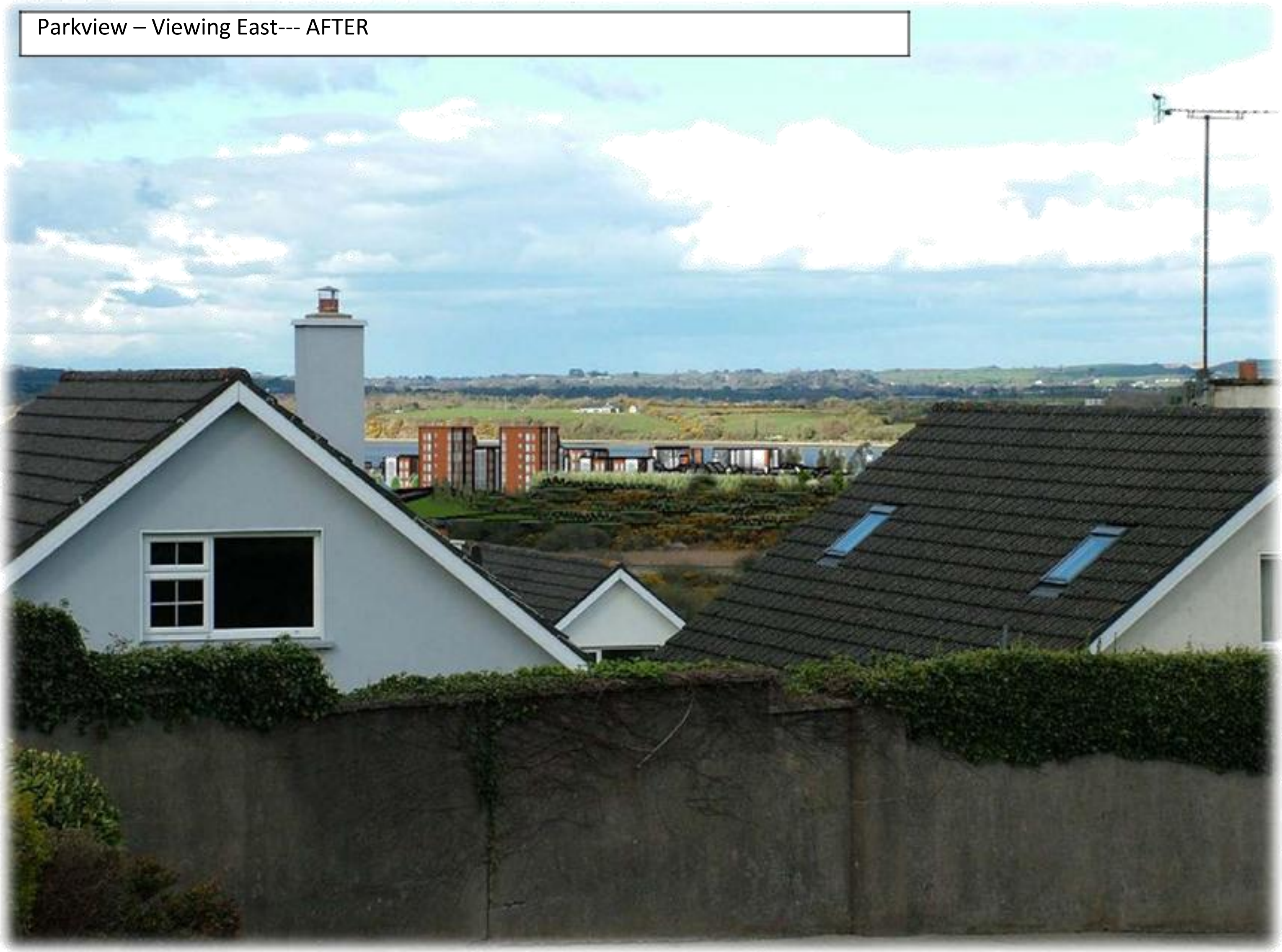
Beach Head at Crosstown- Viewing West --BEFORE

Beach Head at Crosstown- Viewing West --AFTER

N11 – Viewing South east -BEFORE

N11 – Viewing South east -AFTER

Parkview – Viewing East--- BEFORE


Parkview – Viewing East--- AFTER


Wexford Bridge- Viewing North ---BEFORE


Wexford Bridge- Viewing North -- AFTER

Chapter 11 Material Assets – Traffic Impact

11.1 Introduction & Statement of Competency

This Traffic and Transport Assessment Report (TTA) Report has been prepared by Eoin Reynolds of NRB Consulting Engineers Ltd. It addresses traffic and access considerations of the proposed Residential Housing and Apartment development at Carcur Park, Wexford. The location of the proposed development site is below as ***Figure 11.0***

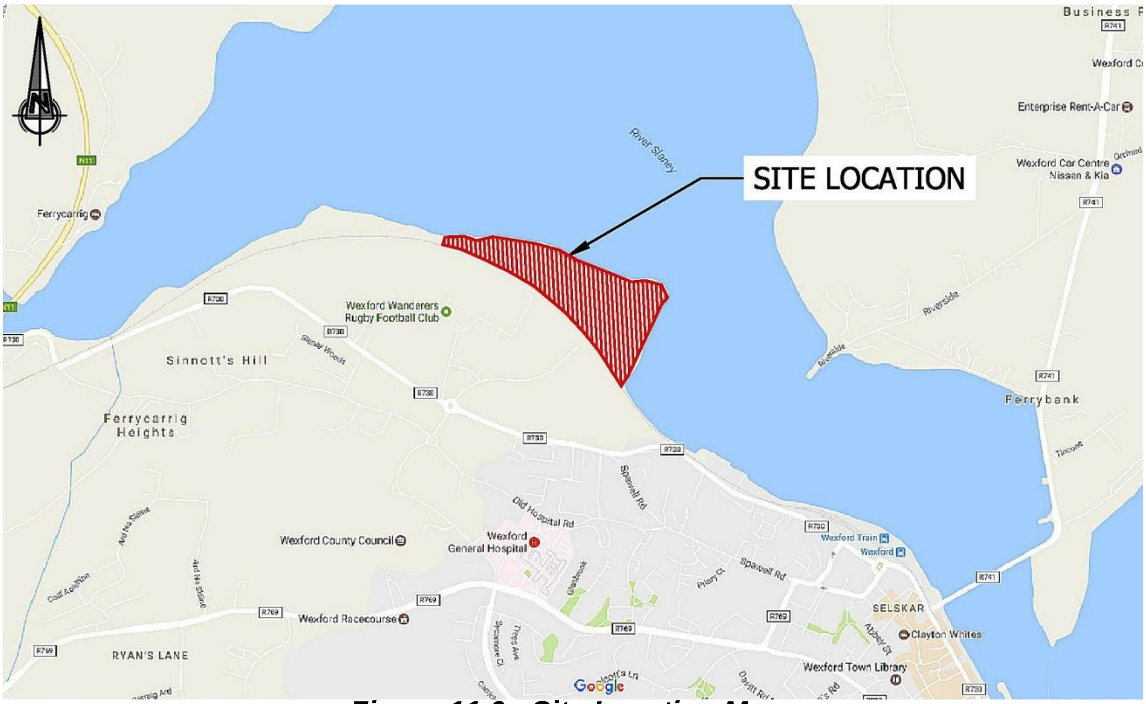


Figure 11.0 - Site Location Map

A layout plan showing the proposed internal arrangement of the proposed development, is included in ***Appendix 11.0*** This shows the layout of the scheme in relation to the local road network and the substantially completed road infrastructure in the area.

The assessment of the impact of the development traffic on the surrounding road network has been based on the following sources of information and industry accepted practices:

- Site visits,
- 2017 Traffic Surveys,
- Trip Rate Information Computer System (TRICS) to establish the absolute worst case Trip Rate associated with the proposed apartments and housing using comparable site information,

- Our wide experience in designing and constructing similar facilities of this nature,
- Transport Infrastructure Ireland (TII) “Traffic and Transport Assessment Guidelines”, (TTA Guidelines),
- Tii Project Appraisal Guidelines Unit 5.3, (Travel Demand Projections Oct 2016, Table 5.3.2),
- TII recommended assessment techniques for quantifying the Traffic Impact

Through the use of the above information this TTA examines the following:

- The internal design and operation of the development proposal,
- Traffic & Operational Safety,
- Accessibility and the linkage between the site and the adjacent roads,
- Assessment of the impact of the proposed development on the local roads,

This Report has been prepared in accordance with the requirements of The Institution of Highways and Transportation “Guidelines for Traffic Impact Assessment” and the TII’s “Traffic & Transport Assessment Guidelines”. These are the professional Guidelines used to assess the impact of developments on public roads.

Statement of Competency

This Report has been prepared by Eoin Reynolds, Director of NRB Consulting Engineers Ltd. Originally from Wexford, Eoin is a Chartered Engineer with over 28 years experience. He specialises in the field of traffic/Transportation and Roads Design, and in assessing the infrastructure needs of development. Eoin provides advice to both private sector and public sector clients on all aspects of Roads, Traffic/Transportation and Mobility Management. He is expert in the use of Traffic Engineering Modelling Software Techniques (TRICS, Junctions 9 TRL Programmes, LiNSiG, TRANSYT and Micro Simulation Modelling Techniques). He has given expert evidence as Planning Appeals, Oral Hearings and Public Inquiries. Eoin was previously Director of the Irish Office of Waterman Boreham Transport Planning and prior to that was Manager of the Belfast Office of JMP Consultants Ltd. He is a noted Professional/Expert Witness in the field of Traffic/Roads and Road Safety.

11.2 RECEIVING ENVIRONMENT

LOCATION

The subject site is located to the west of Wexford Town along the R730, via a new 40m diameter roundabout leading to Faythe Harriers GAA grounds and onwards to the site which is located to the north of the Railway Line.

Appendix 11.0 includes a drawing showing the proposed site layout and its context and configuration in relation to the existing and proposed road network in the area.

SITE CONTEXT, SITE OBSERVATIONS AND TRAFFIC SURVEYS

The proposal consists of development of a residential housing/apartments site to the north of the existing railway line, on lands which have the roads infrastructure already in place to provide high quality accessibility and connectivity.

Access to the site is by way of the established 40m diameter 4-arm R730 Ferrycarrig Road roundabout which was recently constructed at the applicant's expense.

The existing R730 Ferrycarrig Road runs generally in a E-W direction parallel to the Slaney. It is a 50kph section of Regional Road and consists of a single carriageway road which benefits from good footpath linkages along both sides providing access to and from the town centre. Based on the recent traffic survey it carries an Annual Average Daily Traffic (AADT) volume of approximately 3,800 Passenger Car Units (PCUs or car-equivalents). Given that the road has a capacity to carry approximately 1,000 PCUs per-direction per-hour, it is considered lightly trafficked in the context of its link capacity.

The R730 Roundabout connects to the Old Hospital Road Roundabout to the south via a new link road, which then runs further south to connect with the R769 adjacent Wexford general Hospital, at the long established 4-arm traffic signal controlled junction. In these terms the established road network provides for permeability and site-accessibility for multi directional approaches through and around the town.

The Old Hospital Road junction also takes the form of a traditional at-grade 4-arm roundabout junction with the Link Road.

Observation of the performance of the existing roundabouts indicates that the junctions operate in a satisfactory manner during both the weekday AM and PM commuter peaks. Observation also confirmed that vehicle queuing on the approach was rarely in excess of one vehicle and was of short duration.

A comprehensive and extensive classified vehicle turning movement survey of the adjacent road network was undertaken during a neutral period during the third week of January 2017. An illustrated summary of those results is included as traffic flow diagrams in ***Appendix 11.2***

It was noteworthy that there were very few observed cyclists or pedestrian movements on the local roads during either the weekday AM or PM commuter periods

11.3 CHARACTERISTICS OF DEVELOPMENT

The subject site consists of the construction of a modern Residential Development, laid out in streets, all of which have designed broadly in accordance with the Department for Transport Tourism & Sport Guidance, 'The Design Manual for Urban Roads and Streets'. The residential site itself is located to the west of Wexford Town with vehicular access being along the R730, via an established existing 40m diameter roundabout, which also leads to Faythe Harriers GAA grounds and then onwards in a northerly direction to the site, which is located to the north of the Railway Line. The established existing roads, established road junctions, cycle lanes and footpaths have been designed and constructed to accommodate the development of the subject site and the construction of the proposed new Slaney River crossing/bridge. The design of the development and the layout of the roads and infrastructure has been developed to accommodate the future construction of the Slaney River Bridge in this location.

11.4 POTENTIAL IMPACTS OF PROPOSED DEVELOPMENT

CONSTRUCTION STAGE

The subject site will likely be developed in Phases, and subject to market conditions pertaining. It is however normal for the construction details to be agreed with the appointed Contractor for the works following a planning decision. However, the site is a secluded site remote from affected neighbours and served by a high quality established modern road network.

A detailed construction management plan will be prepared prior to construction and this will include preliminary proposed details for securing the site, access arrangements for labour, plant and materials and it will also indicate the locations of construction parking/plant and machine compounds. However it should be recognised that such details are normally best dealt with when details of construction programme and phasing have been confirmed, and these are ordinarily dealt with by way of a suitable worded planning condition in the event that An Bórd Pleanála are minded to grant planning permission..

When the contractor is appointed to prepare advance works on the site, they will prepare a detailed method statement having regard to their own operating procedures, the agreed construction programme, site conditions, and any relevant planning conditions.

The works on the public road (e.g. for services connections, such as any sewer connections) will require an application for a Road Opening Licence and will be submitted by the contractor to the Local Authority which will include a full detailed Construction Traffic Management Plan prepared in accordance with Chapter 8 of the Traffic Signs Manual for pre-approval by the Local Authority and An Garda.

Perimeter hoarding will be provided around the site to provide a barrier against unauthorised access from any adjacent public areas. The Controlled access point to the site, in the form of gates or doors, will be monitored and secured, with a full time Flagman or Banksman during working hours to ensure that any conflicts between construction related traffic and public road users are minimised

Whilst the hours of operation are ordinarily a matter of Condition by the Planning Authority, it is anticipated that the site and building works required to implement the development shall only be carried out between the hours of:

- Mondays to Fridays - 7.00am to 6.00pm
- Saturday - 8.00 a.m. to 2.00pm
- Sundays and Public Holidays - No activity on site.

Deviation from these times is normally only allowed in exceptional circumstances where prior written approval has been received from Wexford County Council following an application for same. Such an application is considered unlikely and would only be made in exceptional or emergency circumstances, and approval may be given subject to conditions pertaining to the particular circumstances.

The construction shift times will ensure that construction traffic will have an insignificant impact upon the traditional peak commuter traffic periods as it is normal practice for construction workers to be at work before 8am in the morning and will leave at 6pm.

The temporary parking of delivery vehicles or construction staff vehicles will not be permitted on public roads and a dedicated compound, offices, canteen facilities, storage &

staff parking area will be constructed as part of the early works to accommodate construction vehicles and worker parking as necessary.

Unfettered and unobstructed access will be maintained at all times to neighbouring properties adjacent the site and no parking on public roads leading to the site will be allowed.

It is considered that the public road vehicular traffic and movement associated with the Construction Stages will be by-far outweighed by the traffic generation of the development when fully constructed and occupied, and the operational assessment is addressed in the following sections of this report. For example, in terms of construction traffic numbers it is anticipated that the construction stage may have up to 30 staff on site at any one time (equating to a worst case max of 30 staff cars at the start and end of each day). At this preliminary stage it is anticipated that there will likely also be a maximum of 30 deliveries by truck per day (or 75 PCUs/car equivalents). These combined equate to a worst case equivalent peak hour Traffic Volume of 40 PCUs. This is some way less than the Operational Stage Traffic Volumes quantified in Table 11.5.2 of this Report. It has been demonstrated that the effect of the traffic associated with the operational stage can be accommodated on the established local road network without any mitigation measures. In this regard, given that Construction Stage Traffic is anticipated to be approximately one fifth the volume of the Operational Stage Traffic, the local roads are also considered more than adequate to accommodate the worst case construction traffic.

CONSTRUCTION STAGE - MITIGATION MEASURES

Construction vehicle movements would be minimised through:

- Consolidation of delivery loads to/from the site and managing larger deliveries to occur outside peak traffic periods,
- Use of precast/prefabricated materials where possible,
- Adequate storage space on site will be provided with no impact on public streets or areas,

The Contractor will adhere to best practice mobility management measures for the site staff to encourage access to the site by means other than the private car. This will be considered by the appointed Contractor prior to works commencing on site.

On site accommodation will consist of:

- Staff welfare facilities
- Dedicated staff parking
- Adequate materials drop-off and storage area located within the site.

The site offices will have integrated welfare facilities including toilet and kitchen facilities for staff.

The following measures will be implemented as required to ensure that surroundings are kept clean and tidy:

- It is proposed that a pre and post commencement condition survey and photographic record of the adjacent affected roads and footpaths will be undertaken in consultation between the appointed Contractor and WCC,
- A regular programme of site tidying will be established to ensure a safe and orderly site,
- Any scaffolding will have debris netting attached to prevent materials and equipment being scattered by the wind,
- Food waste will be strictly controlled on all parts of the site,
- Any spillages on roads & footpaths outside the site will be cleaned regularly and not be allowed to accumulate,
- Wheel-checking and wheel-cleaning facilities will be provided for vehicles exiting the site,
- In the unlikely event of any solid waste being deposited either on the public roads or road gullies any such waste will be removed and disposed of immediately.
- In the event of unintentional damage to road markings or road signage, these will be remediated to the satisfaction of WCC.
- Site Entrance Ahead Signage will be provided on the approaches to the site.

Any works on the public road will require an application for a Road Opening Licence submitted by the contractor to the Local Authority which will include a full detailed Traffic Management Plan prepared in accordance with Chapter 8 of the Traffic Signs Manual for approval by the Local Authority.

OCCUPATION OF RESIDENTIAL ELEMENTS - OPERATIONAL STAGE

The Operational Stage (residential units occupation) of the proposed development is addressed in the following sections below through the completion of a detailed Transportation Assessment, undertaken in accordance with the TIIs Guidelines for Transportation Assessment.

The Operational Stage Impact is addressed under the following headings; -

- Traffic Generation,
- Assessment Years,
- Traffic Assignment and Distribution, and
- Traffic Impact.

The Operational Stage of the completed scheme is expected to generate a total of 154 PCU movements 2-way on the local road network in the AM Peak Hour and 194 PCU movements 2-way in the PM Peak Hour. The capacity of the proposed and established road network and junctions has been assessed to accommodate these volumes of traffic.

FUTURE BRIDGE CROSSING - OPERATIONAL STAGE

We understand that the proposed development scheme and the completed existing local road junctions have been specifically designed with adequate geometry and capacity to safely accommodate the construction of the Future Slaney Bridge Crossing, connecting to and through the subject site.

11.5 TRIP GENERATION, ASSESSMENT YEARS, ASSIGNMENT AND DISTRIBUTION

This Traffic Impact Assessment considers the traffic impact of the entire proposed development, with all of the apartments and all of the houses (and the supporting crèches) completed and fully occupied. This is considered to represent a robust and onerous approach, whilst acknowledging the development will be planned, constructed and occupied in a phased manner. Traffic impact is assessed in terms of the use and is based on the number of individual units in the scheme. We have undertaken a worst case assessment of the quantity of additional traffic the facility will generate, assigned this to the local roads, and assessed the impact.

We have undertaken an assessment of potential traffic generated by the overall completed site using industry standard methods of assessment. We have assigned traffic based on the proposed usage, using the Trip Rate Information Computer System (TRICS). TRICS is long established as the industry standard method of quantifying the worst case traffic generation characteristics associated with different types of development, in this case residential apartments and residential housing.

The TRICS database provides information on trip generation characteristics of a range of development types. TRICS is established in Ireland and contains information on arrival and departure rates for a range of differing types and sizes of development. We have undertaken an appraisal of Trips Generated using the TRICS database, by selecting comparable sites, for the most part sites based in Ireland. This is considered to represent a robust approach, given that we have assumed 100% occupation in 2020, and the reality is that the development will be constructed and occupied in phases.

For the purposes of providing a robust assessment of the impact of the proposed new facility to the Local Authority, we have assessed the traffic associated with the facility as being 100% New traffic.

The full TRICS data output upon which the assessment is based is included herein as ***Appendix 11.1***

The trip generation analysis summarised in ***Table 11.5.0 & Table 11.5.1*** below shows the resulting absolute maximum traffic generated by the housing and apartment elements of the development proposals during the Weekday PM & AM Commuter Peak hours. The total traffic generated is shown in ***Table 11.5.2.***

Table 11.5.0 TRICS Data Summary, 238 No. Apartments

Time Period	Arrivals (Rate/Unit)	Departure (Rate/Unit)	Total 2-Way Cars (Rate/Unit)
Weekday AM Pk Hr	11 (0.048)	42 (0.175)	53 (0.223)
Weekday PM Pk Hr	54 (0.226)	21 (0.09)	75 (0.316)

Table 11.5.1 TRICS Data Summary, 175 No. Private Houses

Time Period	Arrivals (Rate/Unit)	Departure (Rate/Unit)	Total 2-Way Cars (Rate/Unit)
Weekday AM Pk Hr	26 (0.148)	75 (0.431)	101 (0.579)
Weekday PM Pk Hr	75 (0.429)	44 (0.252)	119 (0.681)

Table 11.5.2 Total Traffic Generated by 238 No. Apartments & 175 No. Houses

Time Period	Arrivals (Rate/Unit)	Departure (Rate/Unit)	Total 2-Way Cars (Rate/Unit)
Weekday AM Pk Hr	37	117	154
Weekday PM Pk Hr	129	65	194

For the purposes of this assessment, and to ensure a robust investigation, we have assigned 100% of the traffic generated as New Traffic on the road network for both the assumed opening year 2020 and the design year 2035

Design Years/Traffic Growth

The additional traffic flows are added to the base-network flows factored to a worst case opening year 2020 based on accepted TII traffic growth prediction factors.

Traffic growth factors for future year assessments were calculated from the Tii Project Appraisal Guidelines Unit 5.3, (Travel Demand Projections Oct 2016, Table 5.3.2), in accordance with accepted methodology.

The detailed network trip distribution is as shown in ***Appendix 11.2*** The overall traffic generation for the proposed development as well as the network traffic has been used as the basis for the threshold assessment.

The TII *Traffic and Transport Assessment Guidelines* suggests that an assessment of development traffic impact be conducted on the relevant links or road junctions for the year of opening and during a design year 10 or 15 years after opening.

For the purposes of this TTA only, it is assumed that the year of opening of the proposed development is 2020 and it is considered that in the event of successful planning, the scheme will proceed within a timeframe to allow construction and occupation in a phased manner. However, it is recognised that the development will be phased in terms of construction and occupation. In these terms, assuming full occupation during 2020 represents a robust approach, and this is particularly true in light of the significant reserve capacity in the local junctions (as evidenced by the detailed analysis contained within this report).

Notwithstanding the above, given the favourable results, any small 1-5 year variation with regard to year of opening or 100% completion will not have any significant detrimental effect on the conclusions of this study or the available capacity on the local road network.

Assignment & Distribution
In assigning traffic to any road network, it is usual practice for developments of this nature to assign traffic based on the established traffic patterns and this is the standard methodology which has been employed in this instance.

Traffic has been assigned to the road network using simple hand assignment techniques, with assignment based on existing traffic movements and volumes, in accordance with industry-accepted practice. Any minor alterations to the traffic generation, assignment or distribution are considered very unlikely to affect the conclusions of our study, given the low threshold increases. The network trip distribution is as shown in ***Appendix 11.2***

11.6 TRAFFIC IMPACT

The Institution of Highways and Transportation (IHT) Guidelines for Traffic Impact Assessment and the TII's Traffic and Transport Assessment Guidelines sets out a mechanism for assessment of developments of this nature. These Guidelines have been followed in the assessment of the development impact on the local roads.

We have assessed the impact of the proposed development traffic on the key local junctions, namely: -

- The new R730 Ferrycarrig Road Roundabout, and
- The recently constructed Old Hospital Road Roundabout.

Notwithstanding the expected small increases in traffic, we have undertaken worst case detailed macro simulation modelling of these to determine and prove adequacy to accommodate the worst case increases in traffic.

We have assessed the capacity of the two roundabout junctions using the TII approved package "Junction 9" software, containing ARCADY (Assessment of Roundabout Capacity And DelaY). ARCADY produces results based on a ratio of flow to capacity (RFC) and queue length. An RFC greater that 1.00 indicates that the modelled junction is operating at or above capacity, with 0.85 considered to be the optimum RFC value. We have appended the detailed computer simulation model results (ARCADY Outputs) of the junction modelling in ***Appendix 11.3 and Appendix 11.4***

A summary of the results for the R730 Ferrycarrig Road roundabout at the site is reproduced below as ***Table 11.6.0*** and the results for the Old Hospital Road Roundabout are produced below as ***Table 11.6.1***

Table 11.6.0 : - R730 Ferrycarrig Road Roundabout Junction – Summary ARCADY Results, Worst Case Weekday AM and PM Commuter Peak Hours

Modelled Scenario	Period Mean Max Q (PCUs)	Max RFC
2020 AM Peak Hour	1	0.4
2020 PM Peak Hour	1	0.18
2035 AM Peak Hour	2	0.5
2035 PM Peak Hour	1	0.22

Table 11.6.1 : - Old Hospital Road Roundabout Junction – Summary ARCADY Results, Worst Case Weekday AM and PM Commuter Peak Hours

Modelled Scenario	Period Mean Max Q (PCUs)	Max RFC
2020 AM Peak Hour	1	0.16
2020 PM Peak Hour	1	0.18
2035 AM Peak Hour	1	0.2
2035 PM Peak Hour	1	0.22

It is clear based on the results of the model that there will not be any capacity constraints whatsoever associated with the established existing roundabout junctions, with all RFCs way below the recommended accepted maximum value of 0.85, and all worst case queues are 1-2 vehicles in length.

It is acknowledged that the development will be phased in a manner which results in completions and occupation of parts of the proposed scheme in years beyond 2020, however it is clear from the above assessment that there is adequate capacity in the existing junction geometry to accommodate such an eventuality. In these terms, if the proposed development is phased, this will not result in any impact upon traffic capacity on the local roads

11.7 DO NOTHING SCENARIO

In the event of the development not proceeding, the site would likely remain undeveloped and would remain in broadly-agricultural use. The roads, cycle ways and footpaths, leading to the southern boundary of the site at the railway line, that exist and are currently operational would remain in place and would continue in day to day use by existing established vehicular and non-vehicular traffic.

In the event that the site is undeveloped through the proposed uses, the future bridge crossing would need to de delivered through a normal Part 8 and CPO Process, with resulting significant lengthy procedures and acquisition costs.

11.8 REMEDIAL WORKS

There are no remedial works identified as being required to accommodate the proposed development for the Operational Stage.

For the Construction Stage, the normal Construction Stage mitigation measures are identified above in Section 11.4.

11.9 CONCLUSIONS

This Traffic and Transportation Assessment deals with the traffic capacity issues associated with the proposal to construct a residential development comprising of 238 apartments and 175 houses (with supporting Creches) at Carcur Park, Wexford. It also addresses the construction stage of the proposed development.

We have followed the TII guidelines in the assessment of the impact of the proposed development. The impact of the traffic associated with the proposed development has been assessed, with detailed traffic surveys undertaken and capacity simulation modelling of the key affected junctions.

The existing and absolute worst case projected traffic volumes have been assessed and quantified for the key-critical weekday AM and PM Peak commuter periods and these are included herein as stick diagrams enclosed as ***Appendix 11.2***

It has been demonstrated that the construction and operation of the proposed development will have a negligible and un-noticeable impact upon the continued operation of the adjacent road network.

We conclude that the proposed development is not expected to have any adverse impact in terms of traffic capacity or safety on the surrounding road network. We therefore would encourage a grant of planning for the development from An Bord Pleanála.

CHAPTER 11 - MATERIAL ASSETS; TRAFFIC IMPACT

APPENDICES - CONTENT

APPENDIX 11.0

Proposed Development - Site Layout

DRG. SERIES

3.0 PLANNING

REV	DATE	DRN	NOTES
P03.04	12/03/2018	BLR	Issued to Planning Consultant for Review
P03.03	02/02/2018	BLR	Issued to Planning Consultant for Review
P03.02	25/01/2018	BLR	Isued for Client Review Meeting
P03.01	15/08/2017	BLR	S10-Issued for Planning

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JOB
CARCUR PARK

CLIENT
WILLIAM NEVILLE & SONS

TITLE
Proposed Site Plan (1 of 2)

DATE 30/05/2017 SCALE 1-500
DRN BLR CHECKED MK

JOB NUMBER	DRWG NUMBER	REVISION
P15-209K	RAU-ZZ-ZZ-DR-A-31007	P03.04

DUBLIN OFFICE
DARTRY MILLS,
DARTRY ROAD,
DUBLIN 6,
IRELAND
Tel: + 353 (1) 498 7000
Fax: + 353 (1) 498 7001
info@reddyarchitecture.com
www.reddyarchitecture.com

KILKENNY OFFICE
41 DEAN STREET,
KILKENNY,
IRELAND
Tel: + 353 (56) 776 2697
kilkenny@reddyarchitecture.com
www.reddyarchitecture.com

DRG. SERIES

3.0 PLANNING

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JOB
CARCUR PARK

CLIENT
WILLIAM NEVILLE & SONS

TITLE
Proposed Site Plan (2 of 2)

DATE 30/05/2017 SCALE 1-500
DRN BLR CHECKED MK

JOB NUMBER 15-209K DRWG NUMBER RAU-ZZ-ZZ-DR-A-31008 REVISION P03.04

DUBLIN OFFICE
DARTRY MILLS,
DARTRY ROAD,
DUBLIN 6,
IRELAND
Tel: + 353 (1) 498 7000
Fax: + 353 (1) 498 7001
info@reddyarchitecture.com
www.reddyarchitecture.com

KILKENNY OFFICE
41 DEAN STREET,
KILKENNY,
IRELAND
Tel: + 353 (56) 776 2697
kilkenny@reddyarchitecture.com
www.reddyarchitecture.com

APPENDIX 11.1

TRICS Trip Generation Output
(Residential Houses and Apartments)

Calculation Reference: AUDIT-160301-170119-0149

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 03 - RESIDENTIAL
Category : A - HOUSES PRIVATELY OWNED
VEHICLES

Selected regions and areas:

12	CONNAUGHT		
	GA	GALWAY	1 days
	LT	LEITRIM	1 days
	MA	MAYO	1 days
	RO	ROSCOMMON	4 days
13	MUNSTER		
	WA	WATERFORD	2 days
14	LEINSTER		
	CC	CARLOW	1 days
	KD	KILDARE	1 days
	KK	KILKENNY	3 days
	WX	WEXFORD	1 days
15	GREATER DUBLIN		
	DL	DUBLIN	5 days
16	ULSTER (REPUBLIC OF IRELAND)		
	CV	CAVAN	1 days
	DN	DONEGAL	4 days
17	ULSTER (NORTHERN IRELAND)		
	AN	ANTRIM	3 days
	AR	ARMAGH	1 days
	DO	DOWN	1 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Secondary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter: Number of dwellings
Actual Range: 7 to 280 (units:)
Range Selected by User: 4 to 437 (units:)

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/08 to 25/05/16

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Monday	4 days
Tuesday	9 days
Wednesday	4 days
Thursday	7 days
Friday	6 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	30 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Edge of Town Centre	4
Suburban Area (PPS6 Out of Centre)	12
Edge of Town	12
Neighbourhood Centre (PPS6 Local Centre)	2

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Residential Zone	23
No Sub Category	7

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:

C3	30 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Population within 1 mile:

1,001 to 5,000	13 days
5,001 to 10,000	3 days
10,001 to 15,000	5 days
15,001 to 20,000	5 days
20,001 to 25,000	1 days
25,001 to 50,000	3 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

5,000 or Less	4 days
5,001 to 25,000	9 days
25,001 to 50,000	3 days
50,001 to 75,000	3 days
75,001 to 100,000	5 days
125,001 to 250,000	1 days
250,001 to 500,000	1 days
500,001 or More	4 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

0.6 to 1.0	4 days
1.1 to 1.5	24 days
1.6 to 2.0	2 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

No	30 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:

No PTAL Present	30 days

This data displays the number of selected surveys with PTAL Ratings.

TRIP RATE for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED
VEHICLES
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00	1	30	0.133	1	30	0.033	1	30	0.166
07:00 - 08:00	30	78	0.044	30	78	0.212	30	78	0.256
08:00 - 09:00	30	78	0.148	30	78	**0.431**	30	78	0.579
09:00 - 10:00	30	78	0.177	30	78	0.282	30	78	0.459
10:00 - 11:00	30	78	0.146	30	78	0.170	30	78	0.316
11:00 - 12:00	30	78	0.158	30	78	0.181	30	78	0.339
12:00 - 13:00	30	78	0.223	30	78	0.208	30	78	0.431
13:00 - 14:00	30	78	0.237	30	78	0.234	30	78	0.471
14:00 - 15:00	30	78	0.252	30	78	0.241	30	78	0.493
15:00 - 16:00	30	78	0.296	30	78	0.226	30	78	0.522
16:00 - 17:00	30	78	0.331	30	78	0.215	30	78	0.546
17:00 - 18:00	**30**	**78**	**0.429**	30	78	0.252	**30**	**78**	**0.681**
18:00 - 19:00	30	78	0.342	30	78	0.246	30	78	0.588
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			2.916			2.931			5.847

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.

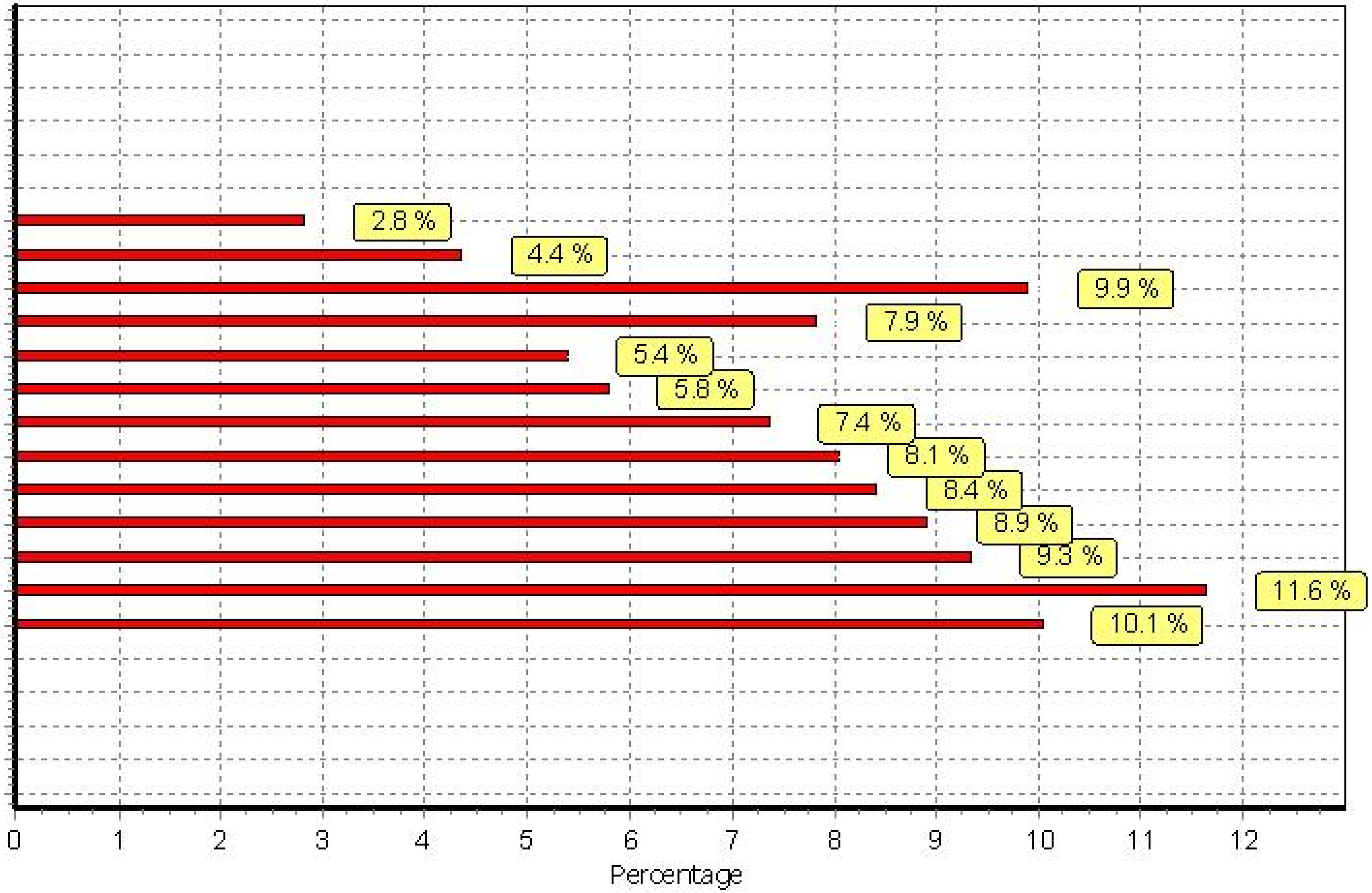
Parameter summary

Trip rate parameter range selected:	7 - 280 (units:)
Survey date date range:	01/01/08 - 25/05/16
Number of weekdays (Monday-Friday):	30
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	2
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

TRIP RATE GRAPH - TOTALS 03 - RESIDENTIAL A - HOUSES PRIVATELY OWNED VEHICLES

TIME	RATE	%
00:00-01:00		
01:00-02:00		
02:00-03:00		
03:00-04:00		
04:00-05:00		
05:00-06:00		
06:00-07:00	0.166	2.8
07:00-08:00	0.256	4.4
08:00-09:00	0.579	9.9
09:00-10:00	0.459	7.9
10:00-11:00	0.316	5.4
11:00-12:00	0.339	5.8
12:00-13:00	0.431	7.4
13:00-14:00	0.471	8.1
14:00-15:00	0.493	8.4
15:00-16:00	0.522	8.9
16:00-17:00	0.546	9.3
17:00-18:00	0.681	11.6
18:00-19:00	0.588	10.1
19:00-20:00		
20:00-21:00		
21:00-22:00		
22:00-23:00		
23:00-24:00		



This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.

Calculation Reference: AUDIT-160301-170125-0150

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 03 - RESIDENTIAL
Category : C - FLATS PRIVATELY OWNED
VEHICLES

Selected regions and areas:

12	CONNAUGHT		
	GA	GALWAY	1 days
13	MUNSTER		
	WA	WATERFORD	1 days
14	LEINSTER		
	KD	KILDARE	1 days
	LU	LOUTH	3 days
16	ULSTER (REPUBLIC OF IRELAND)		
	MG	MONAGHAN	1 days
17	ULSTER (NORTHERN IRELAND)		
	AN	ANTRIM	2 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Secondary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter: Number of dwellings
Actual Range: 20 to 60 (units:)
Range Selected by User: 20 to 86 (units:)

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/08 to 12/05/15

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Monday	2 days
Tuesday	2 days
Thursday	2 days
Friday	3 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	9 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Edge of Town Centre	5
Suburban Area (PPS6 Out of Centre)	3
Edge of Town	1

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Residential Zone	6
No Sub Category	3

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:

C3	9 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Population within 1 mile:

1,001 to 5,000	1 days
5,001 to 10,000	4 days
15,001 to 20,000	2 days
25,001 to 50,000	2 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

5,001 to 25,000	2 days
25,001 to 50,000	3 days
50,001 to 75,000	2 days
75,001 to 100,000	1 days
125,001 to 250,000	1 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

0.6 to 1.0	1 days
1.1 to 1.5	8 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

No	9 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:

No PTAL Present	9 days

This data displays the number of selected surveys with PTAL Ratings.

TRIP RATE for Land Use 03 - RESIDENTIAL/C - FLATS PRIVATELY OWNED
VEHICLES
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

Time Range	ARRIVALS			DEPARTURES			TOTALS		
	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	9	37	0.027	9	37	0.127	9	37	0.154
08:00 - 09:00	9	37	0.048	9	37	**0.175**	9	37	0.223
09:00 - 10:00	9	37	0.066	9	37	0.136	9	37	0.202
10:00 - 11:00	9	37	0.048	9	37	0.063	9	37	0.111
11:00 - 12:00	9	37	0.078	9	37	0.066	9	37	0.144
12:00 - 13:00	9	37	0.087	9	37	0.078	9	37	0.165
13:00 - 14:00	9	37	0.096	9	37	0.066	9	37	0.162
14:00 - 15:00	9	37	0.072	9	37	0.057	9	37	0.129
15:00 - 16:00	9	37	0.078	9	37	0.087	9	37	0.165
16:00 - 17:00	9	37	0.090	9	37	0.093	9	37	0.183
17:00 - 18:00	**9**	**37**	**0.226**	9	37	0.090	**9**	**37**	**0.316**
18:00 - 19:00	9	37	0.130	9	37	0.087	9	37	0.217
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			1.046			1.125			2.171

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.

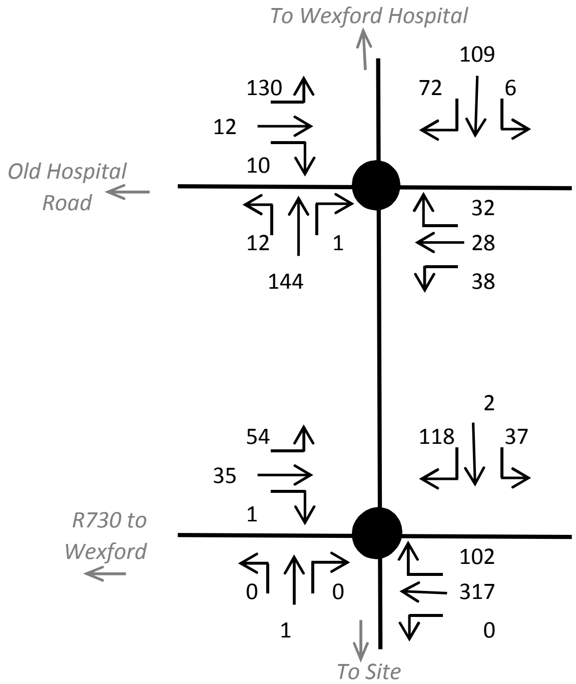
Parameter summary

Trip rate parameter range selected:	20 - 60 (units:)
Survey date date range:	01/01/08 - 12/05/15
Number of weekdays (Monday-Friday):	9
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	0
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

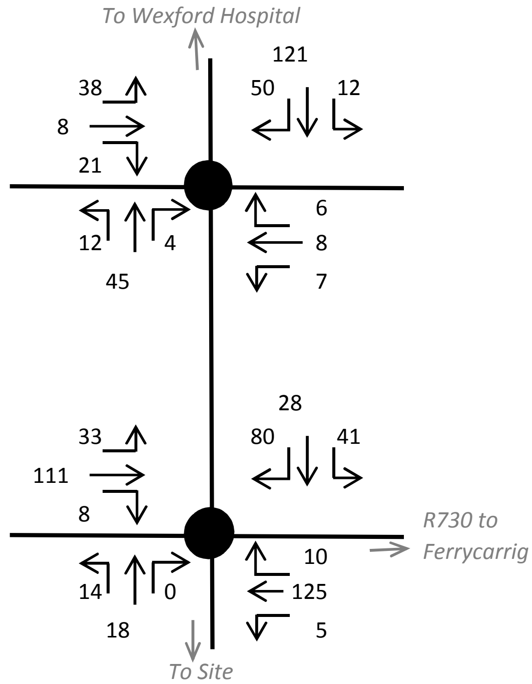
APPENDIX 11.2

Traffic Surveys, Trip Distribution
& Network Traffic Flow Diagrams



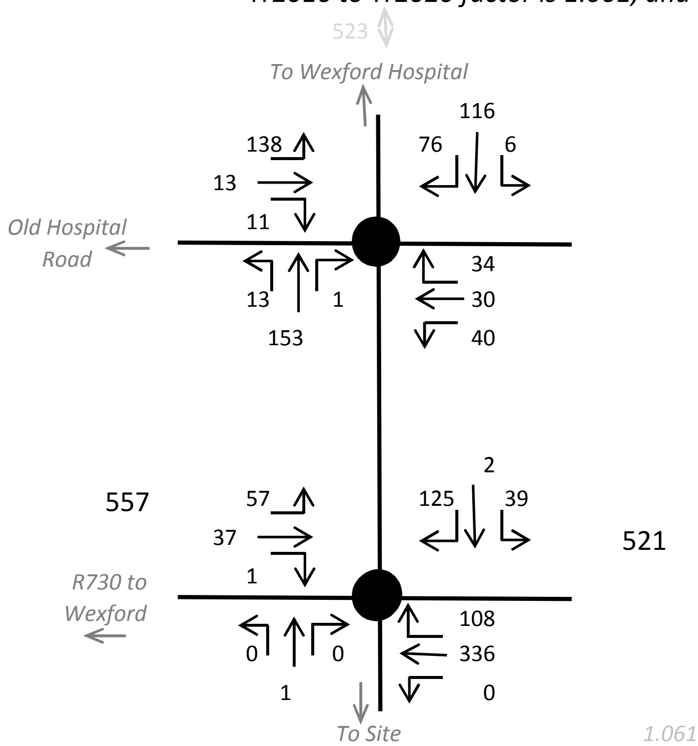
Surveyed Traffic Flow Local Network
AM Peak Hour 2016
<u>Without Development</u> (PCUs)

N

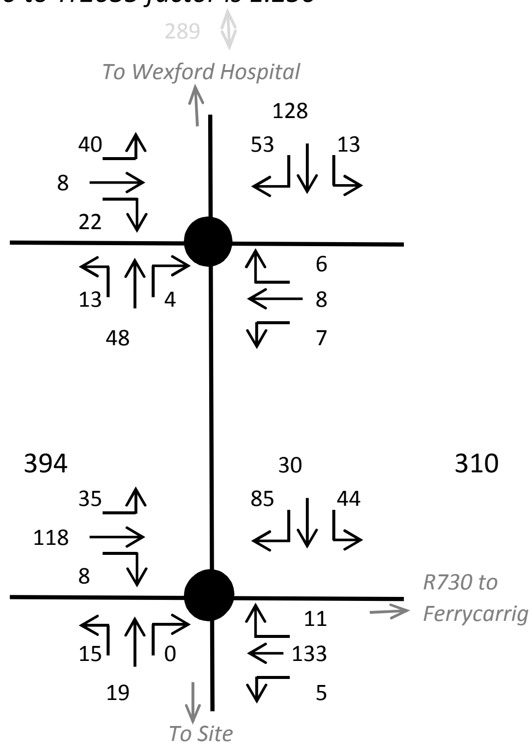


Surveyed Traffic Flow Local Network
PM Peak Hour 2016
<u>Without Development</u> (PCUs)

Tii Project Appraisal Guidelines Unit 5.3, (Travel Demand Projections Oct 2016, Table 5.3.2)
Yr2016 to Yr2020 factor is 1.061, and Yr 2020 to Yr2035 factor is 1.250



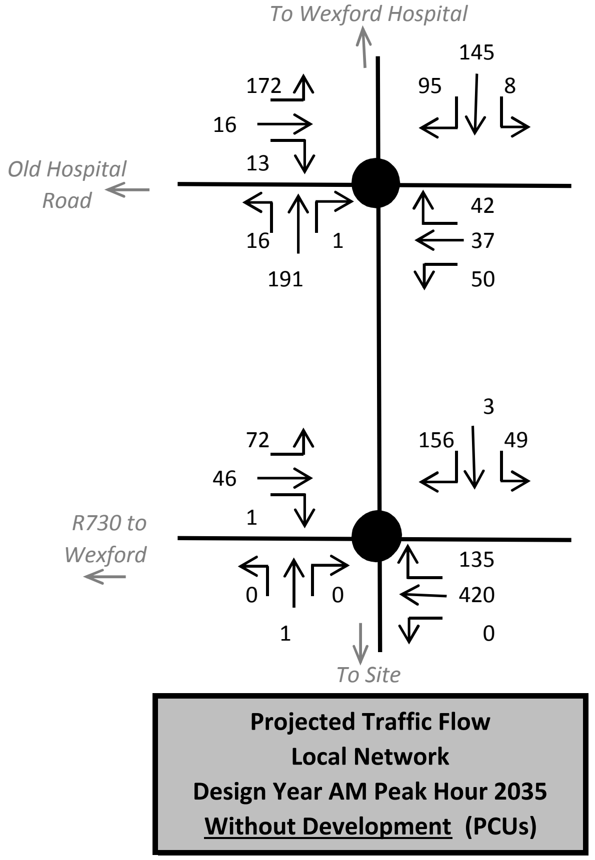
1.061

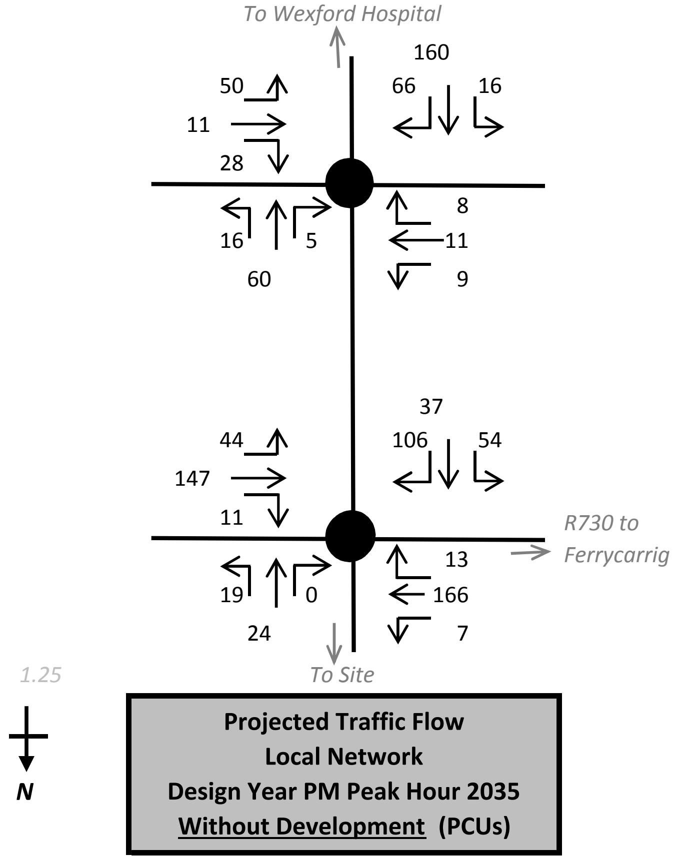


Projected Traffic Flow
Local Network
Opening Year AM Peak Hour 2020
<u>Without Development</u> (PCUs)

N

Projected Traffic Flow
Local Network
Opening Year PM Peak Hour 2020
<u>Without Development</u> (PCUs)





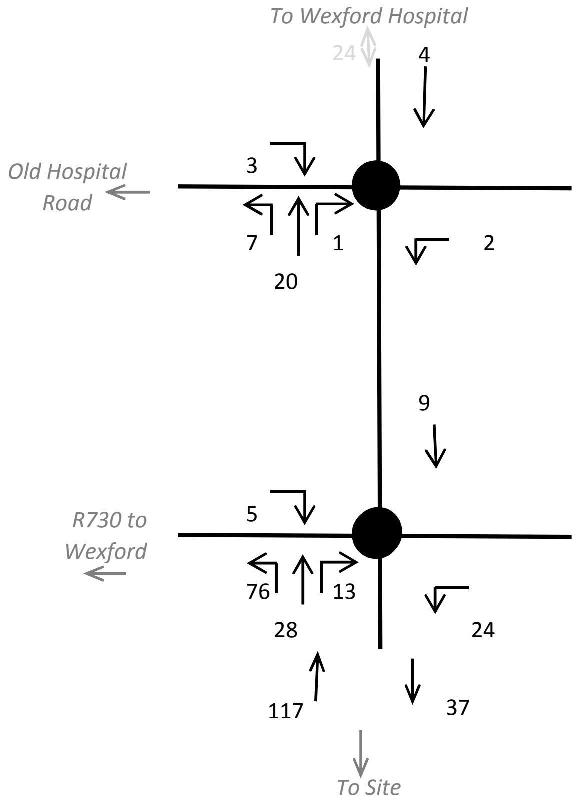
TRICS Data Output - Apartments

Apartments **238** **No.**	Arrivals		Departures		Total 2-Way Car Trips
	Rate/Unit	Car Trips	Rate/Unit	Car Trips	
Weekday AM Commuter Pk Hour	0.048	11	0.175	42	53
Weekday PM Commuter Pk Hour	0.226	54	0.09	21	75

TRICS Data Output - Irish Private Housing

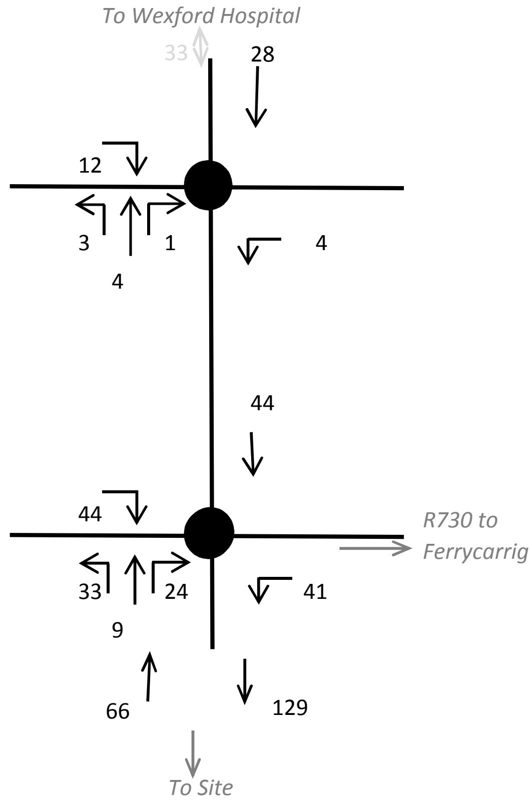
Private Housing **175** **No.**	Arrivals		Departures		Total 2-Way Car Trips
	Rate/Unit	Car Trips	Rate/Unit	Car Trips	
Weekday AM Commuter Pk Hour	0.148	26	0.431	75	101
Weekday PM Commuter Pk Hour	0.429	75	0.252	44	119

Combined Total	Total Arrivals	Total Departures
Weekday AM Commuter Pk Hour	37	117
Weekday PM Commuter Pk Hour	129	66

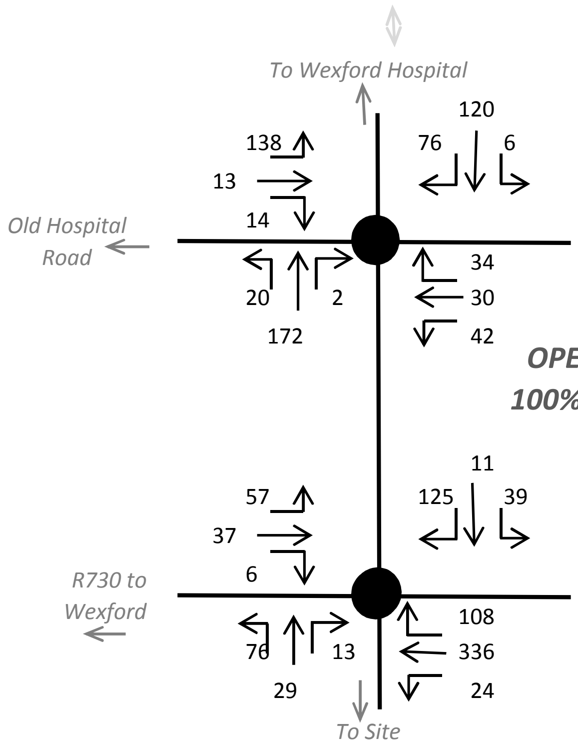


Assignment of Weekdak AM Peak Hour Worst Case Traffic Generated, Based on Established Directional Flows & Proportions

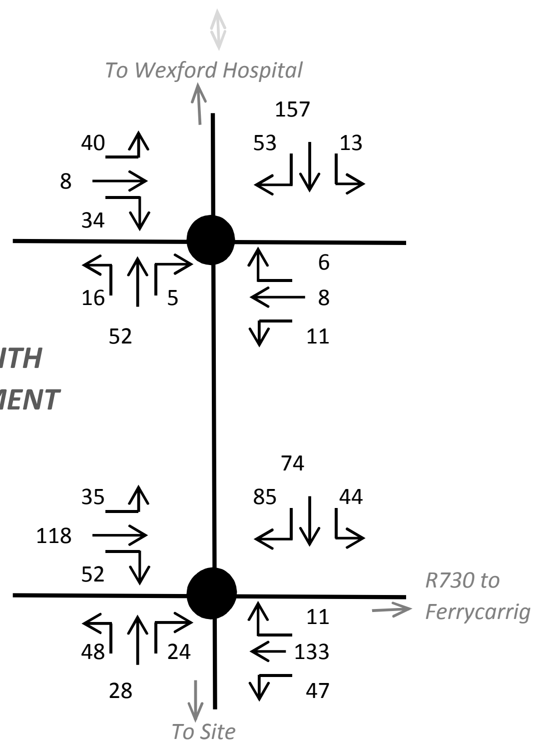
N



Assignment of Weekdak PM Peak Hour Worst Case Traffic Generated, Based on Established Directional Flows & Proportions



OPENING YEAR WITH 100% of DEVELOPMENT (ROBUST).

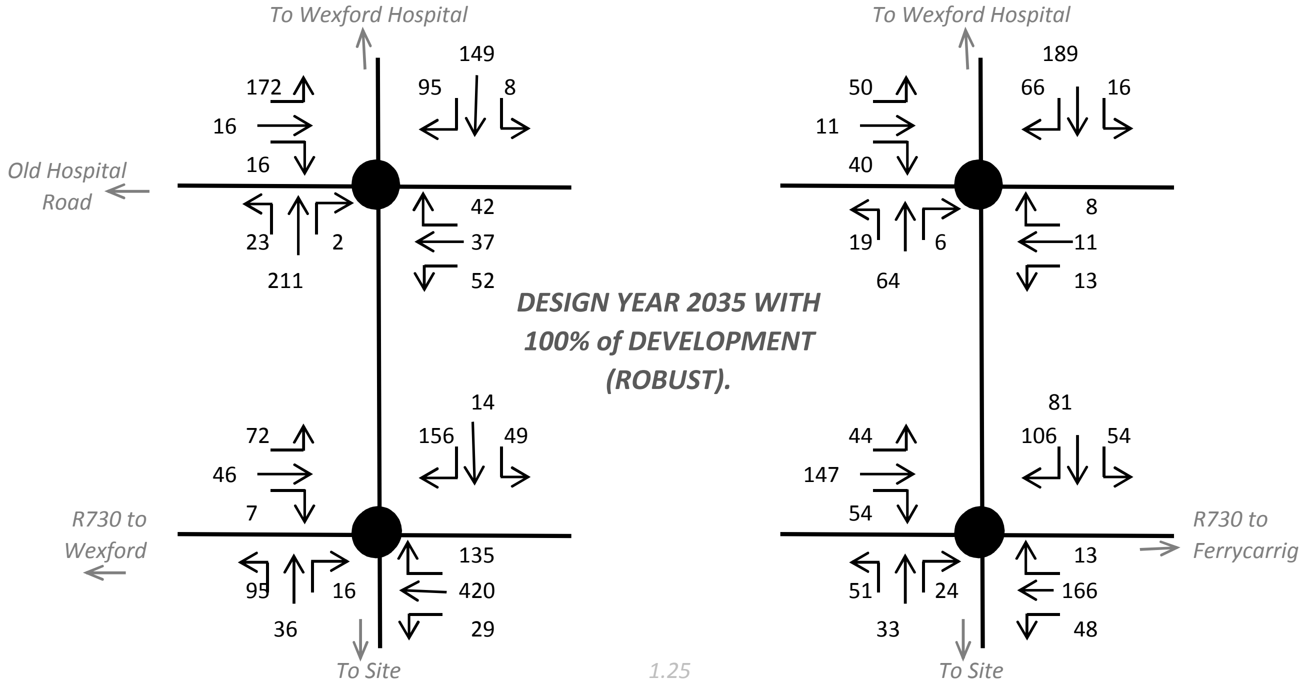


1.03

Projected Traffic Flow (PCUs)
Local Network
Opening Year AM Peak Hour 2020
<u>WITH COMPLETED DEVELOPMENT</u>

N

Projected Traffic Flow (PCUs)
Local Network
Opening Year PM Peak Hour 2020
<u>WITH COMPLETED DEVELOPMENT</u>



Projected Traffic Flow (PCUs)
Local Network
Design Year AM Peak Hour 2035
WITH COMPLETED DEVELOPMENT

N

Projected Traffic Flow (PCUs)
Local Network
Design Year PM Peak Hour 2035
WITH COMPLETED DEVELOPMENT

APPENDIX 11.3

Junction 9 (ARCADY) Simulation Model Output (R730 Roundabout)

ROBUST ANALYSIS ASSUMES FULL DEVELOPMENT IN PLACE

R730 Roundabout – Summary ARCADY Results, Worst Case Weekday AM and PM Commuter Peak Hours 2020 and 2035 WITH ENTIRE OF PROPOSED DEVELOPMENT

Modelled Scenario	Period Mean Max Q (in PCUs)	Max RFC
2018 AM Peak Hour	1	0.4
2018 PM Peak Hour	1	0.18
2033 AM Peak Hour	2	0.5
2033 PM Peak Hour	1	0.22

All of the RFC's are WAY Below 0.85, the theoretical Capacity Limit, and very much below 1.0 (ie 100%) therefore No Problems Whatsoever are expected at the Junction in terms of Operational Capacity Constraints

(This is confirmed through observation of the existing junction Operation).

Junctions 9

ARCADY 9 - Roundabout Module

Filename: R730 Rndabt 2020 AM PM.j9
Path: N:\01 Projects\2017\17-003 Carcur Wexford\Calculations\2018 Arcadys Carcur
Report generation date: 30/04/2018 11:50:17

Summary of junction performance

	AM				PM			
	Q (PCU)	Delay (s)	RFC	LOS	Q (PCU)	Delay (s)	RFC	LOS
	2020							
Arm 1	0.1	4.08	0.13	A	0.1	3.19	0.09	A
Arm 2	0.1	3.42	0.09	A	0.2	3.62	0.18	A
Arm 3	0.2	3.10	0.14	A	0.2	3.47	0.18	A
Arm 4	0.7	4.63	0.40	A	0.2	3.48	0.17	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of Av. delay per arriving vehicle.

File summary

File Description

Title	(untitled)
Location	
Site number	
Date	27/01/2017
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	NRB-004\Eoin
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Av. delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

Calculate Q Percentiles	Calculate residual capacity	RFC Threshold	Av. Delay threshold (s)	Q threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2020	AM	ONE HOUR	07:45	09:15	15
D2	2020	PM	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2020, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R730	Standard Roundabout	4.10	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	To Site	
2	R730 Town Side	
3	Hospital Approach	
4	R730 Ferrycarrig Side	

Roundabout Geometry

Arm	V (m)	E (m)	l' (m)	R (m)	D (m)	PHI (deg)	Exit only
1	3.50	4.50	15.0	20.0	39.0	10.0	
2	3.00	4.30	10.0	20.0	39.0	10.0	
3	3.50	4.50	15.0	20.0	39.0	10.0	
4	3.50	4.50	15.0	18.0	39.0	10.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.605	1401
2	0.579	1270
3	0.605	1401
4	0.602	1394

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2020	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Av. Demand (PCU/hr)	Scaling Factor (%)
1		✓	118	100.000
2		✓	100	100.000
3		✓	175	100.000
4		✓	468	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	76	29	13
	2	6	0	57	37
	3	11	125	0	39
	4	24	336	108	0

Vehicle Mix

HV %s

		To			
		1	2	3	4
From	1	0	1	1	1
	2	1	0	1	1
	3	1	1	0	1
	4	1	1	1	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Q (PCU)	Max LOS
1	0.13	4.08	0.1	A
2	0.09	3.42	0.1	A
3	0.14	3.10	0.2	A
4	0.40	4.63	0.7	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	89	427	1143	0.078	88	0.1	3.448	A
2	75	112	1204	0.063	75	0.1	3.219	A
3	132	42	1376	0.096	131	0.1	2.922	A
4	352	107	1330	0.265	351	0.4	3.709	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	106	511	1092	0.097	106	0.1	3.687	A
2	90	135	1192	0.075	90	0.1	3.299	A
3	157	50	1371	0.115	157	0.1	2.995	A
4	421	128	1317	0.319	420	0.5	4.052	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	130	626	1022	0.127	130	0.1	4.073	A
2	110	165	1174	0.094	110	0.1	3.416	A
3	193	62	1364	0.141	193	0.2	3.103	A
4	515	156	1300	0.396	515	0.7	4.626	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	130	626	1022	0.127	130	0.1	4.075	A
2	110	165	1174	0.094	110	0.1	3.416	A
3	193	62	1364	0.141	193	0.2	3.103	A
4	515	156	1300	0.396	515	0.7	4.633	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	106	512	1091	0.097	106	0.1	3.694	A
2	90	135	1191	0.075	90	0.1	3.300	A
3	157	50	1371	0.115	157	0.1	2.996	A
4	421	128	1317	0.319	421	0.5	4.062	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	89	429	1142	0.078	89	0.1	3.453	A
2	75	113	1204	0.063	75	0.1	3.220	A
3	132	42	1376	0.096	132	0.1	2.925	A
4	352	107	1330	0.265	353	0.4	3.725	A

2020, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R730	Standard Roundabout	3.48	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2020	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Av. Demand (PCU/hr)	Scaling Factor (%)
1		✓	100	100.000
2		✓	205	100.000
3		✓	203	100.000
4		✓	191	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	48	28	24
	2	52	0	35	118
	3	74	85	0	44
	4	47	133	11	0

Vehicle Mix

HV %s

		To			
		1	2	3	4
From	1	0	1	1	1
	2	1	0	1	1
	3	1	1	0	1
	4	1	1	1	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Q (PCU)	Max LOS
1	0.09	3.19	0.1	A
2	0.18	3.62	0.2	A
3	0.18	3.47	0.2	A
4	0.17	3.48	0.2	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	75	172	1297	0.058	75	0.1	2.975	A
2	154	47	1242	0.124	154	0.1	3.338	A
3	153	146	1313	0.116	152	0.1	3.130	A
4	144	158	1299	0.111	143	0.1	3.145	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	90	206	1277	0.070	90	0.1	3.063	A
2	184	57	1237	0.149	184	0.2	3.453	A
3	182	174	1296	0.141	182	0.2	3.265	A
4	172	190	1280	0.134	172	0.2	3.280	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	110	252	1249	0.088	110	0.1	3.192	A
2	226	69	1229	0.184	226	0.2	3.621	A
3	224	213	1272	0.176	223	0.2	3.467	A
4	210	232	1254	0.168	210	0.2	3.482	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	110	252	1249	0.088	110	0.1	3.193	A
2	226	69	1229	0.184	226	0.2	3.621	A
3	224	214	1272	0.176	224	0.2	3.467	A
4	210	232	1254	0.168	210	0.2	3.482	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	90	206	1276	0.070	90	0.1	3.064	A
2	184	57	1237	0.149	184	0.2	3.457	A
3	182	175	1295	0.141	183	0.2	3.269	A
4	172	190	1280	0.134	172	0.2	3.284	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	75	173	1297	0.058	75	0.1	2.976	A
2	154	47	1242	0.124	154	0.1	3.345	A
3	153	146	1313	0.116	153	0.1	3.137	A
4	144	159	1298	0.111	144	0.1	3.151	A

Junctions 9

ARCADY 9 - Roundabout Module

Filename: R730 Rndabt 2035 AM PM.j9
Path: N:\01 Projects\2017\17-003 Carcur Wexford\Calculations\2018 Arcadys Carcur
Report generation date: 30/04/2018 11:55:13

»2035, AM
»2035, PM

Summary of junction performance

	AM				PM			
	Q (PCU)	Delay (s)	RFC	LOS	Q (PCU)	Delay (s)	RFC	LOS
	2035							
Arm 1	0.2	4.75	0.17	A	0.1	3.33	0.10	A
Arm 2	0.1	3.59	0.12	A	0.3	3.81	0.22	A
Arm 3	0.2	3.26	0.18	A	0.3	3.69	0.21	A
Arm 4	1.0	5.74	0.50	A	0.3	3.69	0.20	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of Av. delay per arriving vehicle.

File summary

File Description

Title	(untitled)
Location	
Site number	
Date	27/01/2017
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	NRB-004\Eoin
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Av. delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

Calculate Q Percentiles	Calculate residual capacity	RFC Threshold	Av. Delay threshold (s)	Q threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2035	AM	ONE HOUR	07:45	09:15	15
D2	2035	PM	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2035, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R730	Standard Roundabout	4.85	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	To Site	
2	R730 Town Side	
3	Hospital Approach	
4	R730 Ferrycarrig Side	

Roundabout Geometry

Arm	V (m)	E (m)	l' (m)	R (m)	D (m)	PHI (deg)	Exit only
1	3.50	4.50	15.0	20.0	39.0	10.0	
2	3.00	4.30	10.0	20.0	39.0	10.0	
3	3.50	4.50	15.0	20.0	39.0	10.0	
4	3.50	4.50	15.0	18.0	39.0	10.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.605	1401
2	0.579	1270
3	0.605	1401
4	0.602	1394

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2035	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Av. Demand (PCU/hr)	Scaling Factor (%)
1		✓	147	100.000
2		✓	125	100.000
3		✓	219	100.000
4		✓	584	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	95	36	16
	2	7	0	72	46
	3	14	156	0	49
	4	29	420	135	0

Vehicle Mix

HV %s

		To			
		1	2	3	4
From	1	0	1	1	1
	2	1	0	1	1
	3	1	1	0	1
	4	1	1	1	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Q (PCU)	Max LOS
1	0.17	4.75	0.2	A
2	0.12	3.59	0.1	A
3	0.18	3.26	0.2	A
4	0.50	5.74	1.0	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	111	533	1079	0.103	110	0.1	3.752	A
2	94	140	1188	0.079	94	0.1	3.321	A
3	165	52	1370	0.120	164	0.1	3.014	A
4	440	133	1314	0.335	438	0.5	4.140	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	132	638	1015	0.130	132	0.2	4.119	A
2	112	168	1172	0.096	112	0.1	3.429	A
3	197	62	1364	0.144	197	0.2	3.115	A
4	525	159	1298	0.404	524	0.7	4.694	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	162	781	928	0.174	162	0.2	4.742	A
2	138	205	1151	0.120	138	0.1	3.588	A
3	241	76	1355	0.178	241	0.2	3.262	A
4	643	195	1277	0.504	642	1.0	5.714	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	162	783	927	0.175	162	0.2	4.749	A
2	138	206	1150	0.120	138	0.1	3.589	A
3	241	76	1355	0.178	241	0.2	3.263	A
4	643	195	1277	0.504	643	1.0	5.737	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	132	641	1013	0.130	132	0.2	4.127	A
2	112	168	1172	0.096	112	0.1	3.431	A
3	197	62	1364	0.144	197	0.2	3.116	A
4	525	159	1298	0.404	526	0.7	4.720	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	111	536	1077	0.103	111	0.1	3.764	A
2	94	141	1188	0.079	94	0.1	3.326	A
3	165	52	1370	0.120	165	0.1	3.017	A
4	440	133	1314	0.335	440	0.5	4.168	A

2035, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R730	Standard Roundabout	3.68	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2035	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Av. Demand (PCU/hr)	Scaling Factor (%)
1		✓	108	100.000
2		✓	245	100.000
3		✓	241	100.000
4		✓	227	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	51	33	24
	2	54	0	44	147
	3	81	106	0	54
	4	48	166	13	0

Vehicle Mix

HV %s

		To			
		1	2	3	4
From	1	0	1	1	1
	2	1	0	1	1
	3	1	1	0	1
	4	1	1	1	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Q (PCU)	Max LOS
1	0.10	3.33	0.1	A
2	0.22	3.81	0.3	A
3	0.21	3.69	0.3	A
4	0.20	3.69	0.3	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	81	214	1272	0.064	81	0.1	3.053	A
2	184	53	1239	0.149	184	0.2	3.443	A
3	181	169	1299	0.140	181	0.2	3.250	A
4	171	181	1285	0.133	170	0.2	3.259	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	97	256	1246	0.078	97	0.1	3.163	A
2	220	63	1233	0.179	220	0.2	3.588	A
3	217	202	1279	0.169	216	0.2	3.422	A
4	204	216	1264	0.161	204	0.2	3.430	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	119	313	1211	0.098	119	0.1	3.327	A
2	270	77	1225	0.220	269	0.3	3.805	A
3	265	247	1251	0.212	265	0.3	3.686	A
4	250	265	1234	0.202	250	0.3	3.692	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	119	314	1211	0.098	119	0.1	3.327	A
2	270	77	1225	0.220	270	0.3	3.805	A
3	265	248	1251	0.212	265	0.3	3.687	A
4	250	265	1234	0.203	250	0.3	3.693	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	97	257	1246	0.078	97	0.1	3.164	A
2	220	63	1233	0.179	221	0.2	3.590	A
3	217	203	1279	0.169	217	0.2	3.427	A
4	204	217	1263	0.162	204	0.2	3.433	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	81	215	1271	0.064	81	0.1	3.055	A
2	184	53	1239	0.149	185	0.2	3.450	A
3	181	170	1299	0.140	182	0.2	3.255	A
4	171	182	1285	0.133	171	0.2	3.264	A

APPENDIX 11.4

Junction 9 (ARCADY) Simulation Model Output (Old Hospital Rd Roundabout)

ROBUST ANALYSIS ASSUMES FULL DEVELOPMENT IN PLACE

Old Hospital Rd Roundabout – Summary ARCADY Results, Worst Case Weekday AM and PM Commuter Peak Hours 2020 and 2035 WITH ENTIRE OF PROPOSED DEVELOPMENT

Modelled Scenario	Period Mean Max Q (in PCUs)	Max RFC
2020 AM Peak Hour	1	0.16
2020 PM Peak Hour	1	0.18
2035 AM Peak Hour	1	0.2
2035 PM Peak Hour	1	0.22

All of the RFC's are WAY Below 0.85, the theoretical Capacity Limit, and very much below 1.0 (ie 100%) therefore No Problems whatsoever are expected at the Junction in terms of Operational Capacity constraints

(This is confirmed through observation of the existing junction Operation).

Junctions 9

ARCADY 9 - Roundabout Module

Filename: Old Hosp Rd Rndabt 2020 AM PM.j9
Path: N:\01 Projects\2017\17-003 Carcur Wexford\Calculations\2018 Arcadys Carcur
Report generation date: 30/04/2018 11:34:37

»2020, AM
»2020, PM

Summary of junction performance

	AM				PM			
	Q (PCU)	Delay (s)	RFC	LOS	Q (PCU)	Delay (s)	RFC	LOS
	2020							
Arm 1	0.2	3.32	0.16	A	0.1	2.85	0.06	A
Arm 2	0.2	3.80	0.16	A	0.1	3.19	0.07	A
Arm 3	0.2	3.13	0.16	A	0.2	3.23	0.18	A
Arm 4	0.1	3.19	0.09	A	0.0	3.02	0.02	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of Av. delay per arriving vehicle.

File summary

File Description

Title	(untitled)
Location	
Site number	
Date	27/01/2017
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	NRB-004\Eoin
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Av. delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

Calculate Q Percentiles	Calculate residual capacity	RFC Threshold	Av. Delay threshold (s)	Q threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2020	AM	ONE HOUR	07:45	09:15	15
D2	2020	PM	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2020, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	Old Hospital Rd Rndabout	Standard Roundabout	3.36	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	To Ferrycarrig Rd	
2	Old Hospital Road	
3	New Rd Hospital Approach	
4	Slaney Woods	

Roundabout Geometry

Arm	V (m)	E (m)	l' (m)	R (m)	D (m)	PHI (deg)	Exit only
1	3.50	4.50	15.0	20.0	39.0	10.0	
2	3.00	4.30	10.0	20.0	39.0	10.0	
3	3.50	4.50	15.0	20.0	39.0	10.0	
4	3.50	4.50	15.0	18.0	39.0	10.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.605	1401
2	0.579	1270
3	0.605	1401
4	0.602	1394

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2020	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Av. Demand (PCU/hr)	Scaling Factor (%)
1		✓	194	100.000
2		✓	165	100.000
3		✓	202	100.000
4		✓	106	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	20	172	2
	2	14	0	138	13
	3	120	76	0	6
	4	42	30	34	0

Vehicle Mix

HV %s

		To			
		1	2	3	4
From	1	0	1	1	1
	2	1	0	1	1
	3	1	1	0	1
	4	1	1	1	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Q (PCU)	Max LOS
1	0.16	3.32	0.2	A
2	0.16	3.80	0.2	A
3	0.16	3.13	0.2	A
4	0.09	3.19	0.1	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	146	105	1338	0.109	146	0.1	3.048	A
2	124	156	1179	0.105	124	0.1	3.442	A
3	152	22	1388	0.110	152	0.1	2.939	A
4	80	158	1299	0.061	80	0.1	2.981	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	174	126	1325	0.132	174	0.2	3.159	A
2	148	187	1161	0.128	148	0.1	3.588	A
3	182	26	1385	0.131	181	0.2	3.019	A
4	95	189	1280	0.074	95	0.1	3.067	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	214	154	1308	0.163	213	0.2	3.321	A
2	182	229	1137	0.160	181	0.2	3.804	A
3	222	32	1382	0.161	222	0.2	3.135	A
4	117	231	1255	0.093	117	0.1	3.193	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	214	154	1308	0.163	214	0.2	3.322	A
2	182	229	1137	0.160	182	0.2	3.805	A
3	222	32	1382	0.161	222	0.2	3.135	A
4	117	231	1255	0.093	117	0.1	3.194	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	174	126	1325	0.132	175	0.2	3.160	A
2	148	187	1161	0.128	149	0.1	3.592	A
3	182	26	1385	0.131	182	0.2	3.020	A
4	95	189	1280	0.074	95	0.1	3.070	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	146	105	1337	0.109	146	0.1	3.054	A
2	124	157	1179	0.105	124	0.1	3.450	A
3	152	22	1388	0.110	152	0.1	2.944	A
4	80	158	1299	0.061	80	0.1	2.984	A

2020, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	Old Hospital Rd Rndabout	Standard Roundabout	3.14	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2020	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Av. Demand (PCU/hr)	Scaling Factor (%)
1		✓	73	100.000
2		✓	82	100.000
3		✓	223	100.000
4		✓	25	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	16	52	5
	2	34	0	40	8
	3	157	53	0	13
	4	11	8	6	0

Vehicle Mix

HV %s

		To			
		1	2	3	4
From	1	0	1	1	1
	2	1	0	1	1
	3	1	1	0	1
	4	1	1	1	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Q (PCU)	Max LOS
1	0.06	2.85	0.1	A
2	0.07	3.19	0.1	A
3	0.18	3.23	0.2	A
4	0.02	3.02	0.0	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	55	50	1371	0.040	55	0.0	2.762	A
2	62	47	1242	0.050	62	0.1	3.079	A
3	168	35	1380	0.122	167	0.1	2.997	A
4	19	183	1284	0.015	19	0.0	2.873	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	66	60	1365	0.048	66	0.1	2.798	A
2	74	57	1237	0.060	74	0.1	3.125	A
3	200	42	1376	0.146	200	0.2	3.093	A
4	22	219	1262	0.018	22	0.0	2.932	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	80	74	1357	0.059	80	0.1	2.848	A
2	90	69	1229	0.073	90	0.1	3.191	A
3	246	52	1370	0.179	245	0.2	3.233	A
4	28	268	1232	0.022	28	0.0	3.017	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	80	74	1356	0.059	80	0.1	2.848	A
2	90	69	1229	0.073	90	0.1	3.191	A
3	246	52	1370	0.179	246	0.2	3.233	A
4	28	269	1232	0.022	28	0.0	3.017	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	66	60	1365	0.048	66	0.1	2.798	A
2	74	57	1237	0.060	74	0.1	3.128	A
3	200	42	1376	0.146	201	0.2	3.096	A
4	22	220	1262	0.018	22	0.0	2.935	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	55	50	1371	0.040	55	0.0	2.765	A
2	62	47	1242	0.050	62	0.1	3.082	A
3	168	35	1380	0.122	168	0.1	3.002	A
4	19	184	1283	0.015	19	0.0	2.877	A

Junctions 9

ARCADY 9 - Roundabout Module

Filename: Old Hosp Rd Rndabt 2035 AM PM.j9
Path: N:\01 Projects\2017\17-003 Carcur Wexford\Calculations\2018 Arcadys Carcur
Report generation date: 30/04/2018 11:40:15

»2035, AM
»2035, PM

Summary of junction performance

	AM				PM			
	Q (PCU)	Delay (s)	RFC	LOS	Q (PCU)	Delay (s)	RFC	LOS
	2035							
Arm 1	0.3	3.54	0.20	A	0.1	2.92	0.07	A
Arm 2	0.3	4.12	0.20	A	0.1	3.28	0.09	A
Arm 3	0.3	3.30	0.20	A	0.3	3.41	0.22	A
Arm 4	0.1	3.37	0.12	A	0.0	3.12	0.03	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of Av. delay per arriving vehicle.

File summary

File Description

Title	(untitled)
Location	
Site number	
Date	27/01/2017
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	NRB-004\Eoin
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Av. delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

Calculate Q Percentiles	Calculate residual capacity	RFC Threshold	Av. Delay threshold (s)	Q threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2035	AM	ONE HOUR	07:45	09:15	15
D2	2035	PM	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2035, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	Old Hospital Rd Rndabout	Standard Roundabout	3.59	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	To Ferrycarrig Rd	
2	Old Hospital Road	
3	New Rd Hospital Approach	
4	Slaney Woods	

Roundabout Geometry

Arm	V (m)	E (m)	l' (m)	R (m)	D (m)	PHI (deg)	Exit only
1	3.50	4.50	15.0	20.0	39.0	10.0	
2	3.00	4.30	10.0	20.0	39.0	10.0	
3	3.50	4.50	15.0	20.0	39.0	10.0	
4	3.50	4.50	15.0	18.0	39.0	10.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.605	1401
2	0.579	1270
3	0.605	1401
4	0.602	1394

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2035	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Av. Demand (PCU/hr)	Scaling Factor (%)
1		✓	236	100.000
2		✓	204	100.000
3		✓	252	100.000
4		✓	131	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	23	211	2
	2	16	0	172	16
	3	149	95	0	8
	4	52	37	42	0

Vehicle Mix

HV %s

		To			
		1	2	3	4
From	1	0	1	1	1
	2	1	0	1	1
	3	1	1	0	1
	4	1	1	1	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Q (PCU)	Max LOS
1	0.20	3.54	0.3	A
2	0.20	4.12	0.3	A
3	0.20	3.30	0.3	A
4	0.12	3.37	0.1	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	178	131	1322	0.134	177	0.2	3.173	A
2	154	191	1159	0.133	153	0.2	3.613	A
3	190	25	1386	0.137	189	0.2	3.037	A
4	99	195	1277	0.077	98	0.1	3.086	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	212	156	1307	0.162	212	0.2	3.321	A
2	183	229	1137	0.161	183	0.2	3.812	A
3	227	31	1383	0.164	226	0.2	3.144	A
4	118	234	1253	0.094	118	0.1	3.201	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	260	191	1285	0.202	260	0.3	3.544	A
2	225	281	1107	0.203	224	0.3	4.117	A
3	277	37	1379	0.201	277	0.3	3.301	A
4	144	286	1222	0.118	144	0.1	3.373	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	260	192	1285	0.202	260	0.3	3.545	A
2	225	281	1107	0.203	225	0.3	4.120	A
3	277	37	1378	0.201	277	0.3	3.301	A
4	144	286	1222	0.118	144	0.1	3.373	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	212	157	1306	0.162	212	0.2	3.323	A
2	183	229	1137	0.161	184	0.2	3.818	A
3	227	31	1383	0.164	227	0.2	3.145	A
4	118	234	1253	0.094	118	0.1	3.202	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	178	131	1322	0.134	178	0.2	3.178	A
2	154	192	1158	0.133	154	0.2	3.621	A
3	190	26	1386	0.137	190	0.2	3.040	A
4	99	196	1276	0.077	99	0.1	3.087	A

2035, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	Old Hospital Rd Rndabout	Standard Roundabout	3.28	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2035	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Av. Demand (PCU/hr)	Scaling Factor (%)
1		✓	89	100.000
2		✓	101	100.000
3		✓	271	100.000
4		✓	32	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	19	64	6
	2	40	0	50	11
	3	189	66	0	16
	4	13	11	8	0

Vehicle Mix

HV %s

		To			
		1	2	3	4
From	1	0	1	1	1
	2	1	0	1	1
	3	1	1	0	1
	4	1	1	1	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Q (PCU)	Max LOS
1	0.07	2.92	0.1	A
2	0.09	3.28	0.1	A
3	0.22	3.41	0.3	A
4	0.03	3.12	0.0	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	67	64	1363	0.049	67	0.1	2.805	A
2	76	59	1236	0.062	76	0.1	3.134	A
3	204	43	1375	0.148	203	0.2	3.101	A
4	24	221	1261	0.019	24	0.0	2.939	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	80	76	1355	0.059	80	0.1	2.851	A
2	91	70	1229	0.074	91	0.1	3.193	A
3	244	51	1370	0.178	243	0.2	3.226	A
4	29	265	1234	0.023	29	0.0	3.015	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	98	94	1345	0.073	98	0.1	2.916	A
2	111	86	1220	0.091	111	0.1	3.278	A
3	298	63	1363	0.219	298	0.3	3.413	A
4	35	325	1199	0.029	35	0.0	3.124	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	98	94	1345	0.073	98	0.1	2.916	A
2	111	86	1220	0.091	111	0.1	3.278	A
3	298	63	1363	0.219	298	0.3	3.413	A
4	35	325	1198	0.029	35	0.0	3.125	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	80	76	1355	0.059	80	0.1	2.851	A
2	91	70	1229	0.074	91	0.1	3.194	A
3	244	51	1370	0.178	244	0.2	3.228	A
4	29	265	1234	0.023	29	0.0	3.015	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	67	64	1362	0.049	67	0.1	2.806	A
2	76	59	1236	0.062	76	0.1	3.137	A
3	204	43	1375	0.148	204	0.2	3.107	A
4	24	222	1260	0.019	24	0.0	2.943	A

Chapter 12 Cultural Heritage -Archaeological Potential

Statement of Competency

Catherine McLoughlin is a licenced archaeological consultant with over 20 years post-graduate experience in the archaeological and heritage sectors. She graduated from Queens University Belfast in 1995 with a BSc(Hons) in Archaeology & Paleoecology and became eligible to direct archaeological excavations under state-issued licence in 1998. Catherine co-founded a heritage consultancy in 2001 and undertakes all types of archaeological evaluations and assessments for clients in both the private and public sectors.

12.0 Introduction

Planning permission is being applied for by William Neville & Sons Ltd., for the construction of over 400 housing units within a 5 hectare area at Park, Carcur, Co. Wexford (Figs. 12.0-12.4). The client has commissioned an archaeological assessment to accompany the planning submission.

This document forms the report of the archaeological assessment of the proposed development site and is organised under a series of headings relevant to the fieldwork and research undertaken. A site inspection undertaken as part of the assessment found that a substantial proportion of the development site is a disused quarry. However, three areas within the site were noted to be relatively undisturbed ground and were selected for archaeological testing which was carried out under licence 16E0107. The archaeological testing uncovered a field boundary and furrows within Area 1. Archaeological monitoring of certain areas of the proposed development site has been recommended.

The report is based on historic and cartographic research along with site inspection and archaeological testing. An impact statement is included which details the potential impacts of the proposed development along with suggested mitigation measures to address these.

12.1 Methodology

The data contained within this report has been collated from a number of sources:

- Archaeological Survey of Ireland
- 1st and 2nd edition historic mapping
- Griffith's Valuation map
- Aerial photographs available at www.osi.ie
- National Inventory of Architectural Heritage at www.buildingsofireland.ie
- Archaeological excavations bulletin at www.excavations.ie
- Unpublished archaeological reports
- Wexford Town & Environs Development Plan
- Secondary sources (see bibliography)

The report been prepared in accordance with a number of guideline documents:

- 'Framework & Principles for the Protection of the Archaeological Heritage' issued by the DAHGI (1999)
- 'Guidelines on the Information to be contained in Environmental Impact Statements' issued by the EPA (2002)

All recommendations made in this report relate to the statutory protection and legislative framework of the National Monuments Acts (1930-2014) and the Heritage Act (2000). Recommendations are outlined in Section 10 of the report and include the following measures:

- Archaeological monitoring of groundworks relating to the proposed development

12. 2 Characteristics of The Proposed Development

The proposed development will entail the construction of over 400 housing units and all associated site works within the entirety of the proposed development site. Extensive cut and fill is proposed including the importation of materials.

12.3 The Receiving Environment

The proposed development site is situated in the townland of Park which lies approximately 1km to the north-west of Wexford town centre. The site comprises a small peninsula on the estuary of the River Slaney with the Wexford to Dublin railway line forming the southern boundary. The site is heavily overgrown in places and was quarried extensively in the recent past. Remains of quarry equipment and spoil-heaps can be seen throughout.

12. 4 Archaeological Background

The proposed development site is situated in the townland of Park which lies on the northern outskirts of Wexford town. The site is located approximately 1km to the northwest of Wexford's Zone of Urban Archaeological Potential. The town of Wexford was founded as a defended Viking centre in the late ninth or early tenth century. No definite evidence exists for a settlement prior to that period. The earliest reference to Viking activity in the town is 888AD, and the Annals of the Four Masters make further references in 928 and 933 (Hore 1906, 12).

The location of the initial Norse base is likely to have been at the southern end of the town, in the vicinity of Harpers Lane / South Main Street. This area is where the only two Viking-age archaeological sites have been excavated within the town. The shallow waters of Wexford harbour suited Viking ships and the new town was named *Weisfjord* or the 'harbour of the mud flats'.

The Viking / Hiberno Norse town extended from around King Street Lower at the South to Anne Street at the north. Viking activity is also recorded outside the town wall in the form of extramural parishes such as St. Selskar's and suburbs such as The Faythe. The market place, now known as Cornmarket, was also situated outside the northern extent of the Viking town. The town was probably enclosed by an earthen bank and enclosing ditch, as suggested by Giraldus Cambrensis (Cahill & Ryan 1981, 56). There is however no archaeological or historical source which accurately describes the Viking defences.

Little more is known of Wexford until the late twelfth century when it was attacked by Anglo-Normans who had arrived in Bannow Bay in 1169. Initially the resident Norse repelled the attack, however they later surrendered the town after retreating within the walls and burning the suburbs. The Normans then set about strengthening the town defences and the success of the town following the Anglo-Norman invasion is partly due to its status as an existing Hiberno-Norse urban settlement.

During the visit of Henry II to Ireland in 1172-3 the monarch spent six weeks in Wexford town before granting it to Richard de Clare, also known as Strongbow. Under Strongbow the town became the principal centre of his Lordship. De Clare died three years later in 1176 and under the rule of his successor, William Marshall, Wexford became for the first time the administrative centre of a County of the same name (Colfer 2002, 159).

Following the consolidation of the town defences the Normans built a castle and expanded the town. The castle, built of stone by 1231, was situated on a high point overlooking the sea, just outside the town walls at the southern limit of the medieval town. An expansion of the town occurred sometime during the fourteenth century. The town walls were then extended as far north as Selskar Abbey. As no murage grants survive for the building of the town wall the exact date of construction is unclear.

The streetscape of the medieval town was largely based on the Viking town with two streets running parallel to the shoreline, Main Street and High Street. Between these two principal streets a number of small laneways, such as Keyser's Lane, accessed the seashore and quays. It is likely that no major alterations in the Viking town layout were introduced, and excavation within the town has revealed that property boundaries have remained consistent from around 1200 (Bourke 1989, 59).

Extensive lengths of the town wall still survive and the sites of six town gates with associated roads can be identified. These are Castle Gate, Bride's gate, Peter's Gate, Kayser's gate, John's gate and West or Cow Gate (Colfer 1991, 16).

Wexford was a busy sea port by the second half of the twelfth century but the foundation of New Ross in the thirteenth century had a major impact on the prosperity of the town. It is likely that New Ross' success as a port town was a result of the navigability of the River Barrow. Wexford town did however continue to expand into the fourteenth, fifteenth and sixteenth centuries.

In the mid seventeenth century Wexford was attacked by Cromwell's forces. One Nicholas Rochford writing in 1642 describes how the townspeople '*proceeded to intrench the town walls (all about the town without the walls) eight foot deep and twenty-four foote broad and cleared the whole wall (on the) within side for eight foote from all houses and Pales*' (Hore 1906, 254). In 1649 Cromwell described the wall as strong and ramparted with a fifteen foot wide bank. He also referred to two stones walls on the western side '*well lined with earth*' (Cahill & Ryan 1981, 57).

Cromwell's troops however gained admission to the town, Lewis records in his topographical dictionary, either by force or through the treachery of the town governor (Browne & Wickham 1983, 144).

During 1798 the town was the chief position of the United Irish insurgent forces. After the defeat of a detachment of the king's troops at the Three Rocks on the 30th May the town was evacuated by the garrison and immediately taken possession of by the insurgents (*ibid*., 144). On the advance of the royal army, after the defeat of the main body of insurgents on Vinegar Hill in Enniscorthy, the town was abandoned and once again taken by the king's troops.

In the eighteenth and nineteenth centuries Wexford town continued to expand. This expansion, coupled with the continued silting of WexfordHarbour led to significant waterfront reclamation. In 1837 the town was described by Lewis as '*a seaport, borough, market, post and assize town, in the barony of Forth, county of Wexford, containing 10,673 inhabitants*' (*ibid*., 143). The present quays were constructed in the early nineteenth century and the Dublin to Rosslare railway line was opened in 1854.

The proposed development site is located approximately 1km to the northwest of the town on the shore of the Slaney estuary in a sheltered position just upstream of Wexford Harbour. The townland name of Park is likely to refer to the medieval deerpark was encompassed the whole of the townland and was associated with the medieval manor of Carrick (Beglane 2015, 31). The medieval manor of Carrick was situated to the north-west of Wexford town and was a significant manor throughout the medieval period.

The topography of the site, which is essentially a low rounded peninsula extending out into the river, makes it an ideal site for maritime exploitation of any archaeological date from the Mesolithic to the Hiberno-Norse and later. A number of prehistoric archaeological sites have been uncovered on development sites in its vicinity (See section 12.5 below).

12.5 Previous Archaeological Investigations

A number of previous archaeological investigations have been undertaken within the last 10 years within 1.5km of the proposed development site.

Ballyboggan – (archaeological licence 06E1089). Test trenching was undertaken by Stafford McLoughlin Archaeology at this site following field inspection which noted the possibility of extant burnt mound sites within the proposed development. Burnt mounds are mounds or spreads of heat-shattered stones within charcoal rich soil which generally date to the Bronze Age (2500-500 BC). Archaeological monitoring was subsequently undertaken within the same development site and further burnt spreads were uncovered adjacent to the Newtown Road. None of the archaeological sites have been excavated as all development on the land ceased.

Carricklawn – (archaeological licence 07E914). Archaeological monitoring was undertaken by Stafford McLoughlin Archaeology on the site of Wexford County Council's new building at Carricklawn in 2007. The archaeological testing uncovered a small disturbed burnt mound site which was fully excavated and preserved by record.

Carricklawn – (archaeological licence 07E912). Archaeological monitoring undertaken by Margaret Gowen and Co. Ltd at the site of the new Department of Environment building in Carricklawn in 2007 uncovered the remains of a large truncated spread of burnt mound material. The archaeological licence was subsequently transferred to Stafford McLoughlin Archaeology and the burnt mound was preserved *in-situ*.

*Stonybatte*r –(archaeological licence 07E1167). Archaeological testing was undertaken by Stafford McLoughlin Archaeology in 2008 at a development site at Park. No archaeological features or deposits were uncovered.

Ballyboggan, Carricklawn, Stonybatter – (archaeological licence 11E022). Archaeological testing of the Wexford Inner Relief Road was undertaken by Stafford

McLoughlin Archaeology in 2011. No archaeological features or deposits were identified.

12. 6 Cartographic and Photographic Research

The earliest accurately scaled map of the area is the first edition Ordnance Survey map which dates to 1841 (Fig. 12.2). From this it can be seen that the overall shape of the development site was much as it appears today. The area was divided into fields and a farm with associated laneways was present.

By the time of the compilation of the second edition Ordnance Survey map of c.1903, not much had changed in the layout of the fields. The most notable change at this time was the construction of the railway which can be clearly seen on the southern boundary of the site.
A number of aerial photographs of the site are available to view online at www.geohive.ie. The photos date to 1995, 2000, 2005 and 2015. From the photographs it can be seen that the area of the proposed development site has not been altered in the last 20 years and that the remains of a quarry is visible. It can also be seen that the proposed development site is extensively covered in scrub.

No previously unidentified archaeological features were noted during the cartographic and photographic research.

12. 7 Site Inspection; Plates 12.0- 12.4

The proposed development site was inspected in January 2016. The site is accessed via a small bridge over the railway line which forms its southern boundary. The area of proposed development is currently one large space with no field boundaries but heavily covered with scrub in places. The majority of the site is a disused sand and gravel quarry. There is quarry equipment still visible within the site and track remnants can still be seen through the area. Towards the shore-side of the site some small areas have been left unquarried and it can be seen that in excess of two metres of material has been removed from much of the site.

There is a small, low-lying spur of land jutting out into the water at the eastern end of the site and this area appears not to have been quarried.

Within the quarry area there are large dumps of both dog whelks and muscle shells. These large dumps of shell are the waste debris of fish processing from a factory in Wexford town which has now closed (local fisherman pers.comm).

Towards the western side of the proposed development site there is dense scrub growth within an area which also appears to have been completely quarried out.

12. 8 Archaeological Testing

Archaeological testing of the proposed development site was undertaken on the 19th and 20th April 2016 under licence 16E0107 (Figs. 12.4-12.7). An inspection of the site and analysis of cartographic and aerial photography sources showed that the site had mostly been quarried and that areas of undisturbed ground were few. However it was possible to select three areas for archaeological testing. These were located close to the water. In Area 1 a total of 8 trenches were excavated, in Area 2 10 trenches were excavated and in Area 3 2 trenches were excavated. The trenches were excavated by a large tracked excavator fitted with a 1.3m wide toothless bucket. In Area 1 an area of furrows and other linear features was uncovered. In Area 2 there were no features and in Area 3 the ground had been previously disturbed by quarry workings.

Area 1; Plates 12.5-12.7

Trench 1

Trench 1 measured 43.5m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. The trench contained a series of furrows which were on average 0.6m side and all oriented the same direction. A single possible linear feature, C2, was uncovered in this trench. Investigation by hand failed to confirm whether this feature was archaeological in origin.

Trench 2

Trench 2 measured 25m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. A series of furrows were uncovered and a larger linear feature, C3, was uncovered. As this feature follows the orientation of the furrows it is assumed to date to the same period.

Trench 3

Trench 3 measured 32m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. A series of furrows were uncovered as well as a larger linear feature which may be the continuation of C3.

Trench 4

Trench 4 measured 32m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. A series of furrows were uncovered.

Trench 5

Trench 5 measured 11m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. Two furrows were uncovered.

Trench 6

Trench 6 measured 37m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. A series of furrows were uncovered.

Trench 7

Trench 7 measured 23m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. A series of furrows were uncovered.

Trench 8

Trench 8 measured 22m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. A series of furrows were uncovered.

Area 2; Plates 12.9-12.11

Area 2 was located toward the northeastern limit of the site. A series of 10 test trenches were excavated. No archaeological features or deposits were uncovered in any of the trenches.

Trench 9

Trench 9 measured 66m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. No features were uncovered.

Trench 10

Trench 10 measured 14.5m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. No features were uncovered.

Trench 11

Trench 11 measured 11.5m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. No features were uncovered.

Trench 12

Trench 12 measured 11.5m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. No features were uncovered.

Trench 13

Trench 13 measured 13m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. No features were uncovered.

Trench 14

Trench 14 measured 13m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. No features were uncovered.

Trench 15

Trench 15 measured 16m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. No features were uncovered.

Trench 16

Trench 16 measured 11.5m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. No features were uncovered.

Trench 17

Trench 17 measured 9.5m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. No features were uncovered.

Trench 18

Trench 18 measured 7.5m in length. The stratigraphy uncovered consisted of 0.5m of topsoil and ploughsoil, C1, which overlay yellow / orange glacial subsoil. No features were uncovered.

Area 3

Area 3 was located along the northern boundary of the site. Two test trenches were excavated and in one the ground was found to have been previously disturbed by the quarry workings.

Trench 19

Trench 19 measured 23m in length. The stratigraphy uncovered consisted of 0.5m of topsoil which overlay a very compact stony subsoil. No features were uncovered.

Trench 20

Trench 20 measured 13m in length. The ground here was disturbed with buried tarmac and concrete deposits.

Summary

The excavation of a series of 20 test trenches at three different locations has not identified any features of definite archaeological significance. One undated linear feature, C2, was uncovered in Trench 1 within Area 1, otherwise the features in this area consisted of furrows with an accompanying field boundary. Generally, but not always, these features date to the post-medieval period.

12.9 Potential Impacts of the Proposed Development

Archaeological potential is generally only concerned with the construction phase of development as construction activity is the stage of the process most likely to disturb ground and unearth potential archaeological material. As the development will entail the construction of a large number of units with all associated site works there will be an impact on undisturbed ground through-out the site. However Areas 2 and 3 did not contain any archaeological features so it is considered that there will be no adverse impact from construction in these areas.

Area 1 contained an apparently post-medieval field system plus a possible linear feature of unknown date. The current proposals for the development are to retain this area as an undeveloped green space. There will therefore be no impact to the features in Area 1.

Following extensive field-walking of the entire development site it is considered that the remainder of the proposed development site outside of the areas tested has been extensively quarried in the past removing all of the former original ground surface. Due to this there will be no adverse impact of the proposed development on the remainder of the subject site.

Construction of the proposed hard boundary wall, for the purpose of protecting exiting otter habitat along the shore-side of the development perimeter has the potential to unearth further archaeological materials.

12.10 Do Nothing Scenario

The do nothing scenario in this instance would result in the preservation of any potential undiscovered archaeological materials.

12.11 Mitigation Measures (Remedial Works)[1]

It is recommended that the mitigation measures set out below are implemented to ensure the preservation by record or preservation *in-situ* of any archaeological features or deposits which may be impacted by the proposed development:

- Any future development of Area 1 should be subject to archaeological monitoring under licence by a suitably qualified archaeologist.
- All boundary treatment/habitat protection measures in the foreshore area should be subject to archaeological monitoring during construction.

12.12 Monitoring

No post-construction monitoring is required. Archaeological mitigation at construction stage is the methodology to be implemented.

12.13 Conclusions and Recommendations

The proposed development site at Park is situated on the shoreline of the Slaney estuary in an area which is considered to have archaeological potential. Coastal archaeological sites are recorded in many parts of Ireland including Co. Wexford. There are a number of prehistoric sites known as 'burnt mounds' located within 1.5km of the proposed development and these sites attest to Bronze Age activity in the area overlooking the Slaney estuary. In addition the area of the proposed development was part of a medieval deer-park.

The proposed development site has however been the subject of quarrying in the twentieth century and a large proportion of the original ground level has been quarried away. The archaeological potential of the site has therefore been greatly reduced by the quarrying activity.

Archaeological testing was undertaken under licence 16E107 on the 19th and 20th April 2016 within three areas not previously subject to quarrying activity. No

[1] All recommendations are subject to the approval of the Department of Culture, Heritage & Gaeltacht.

archaeological features or deposits were uncovered in Areas 2 or 3, and the remains of an apparently post-medieval field system plus an unknown linear feature were uncovered in Area 1.

Area 1 is being retained as a green space within the development site. There will therefore be no impact on this area with the current proposals. The recommendation is for archaeological monitoring of Area 1 should this area be subject to impact, plus archaeological monitoring of the installation of habitat protection measures.

12.14 Bibliography

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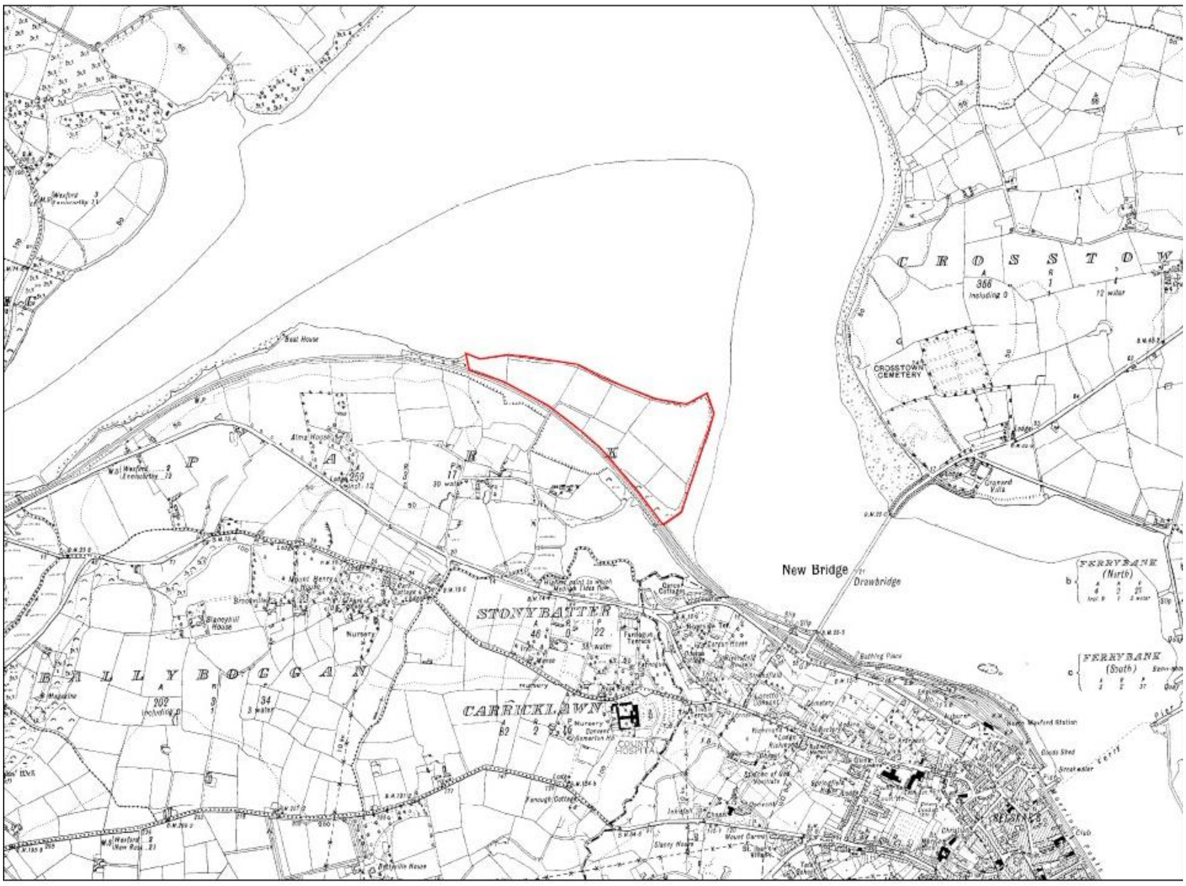

Fig. 12.0 Site location, Park, Co. Wexford.

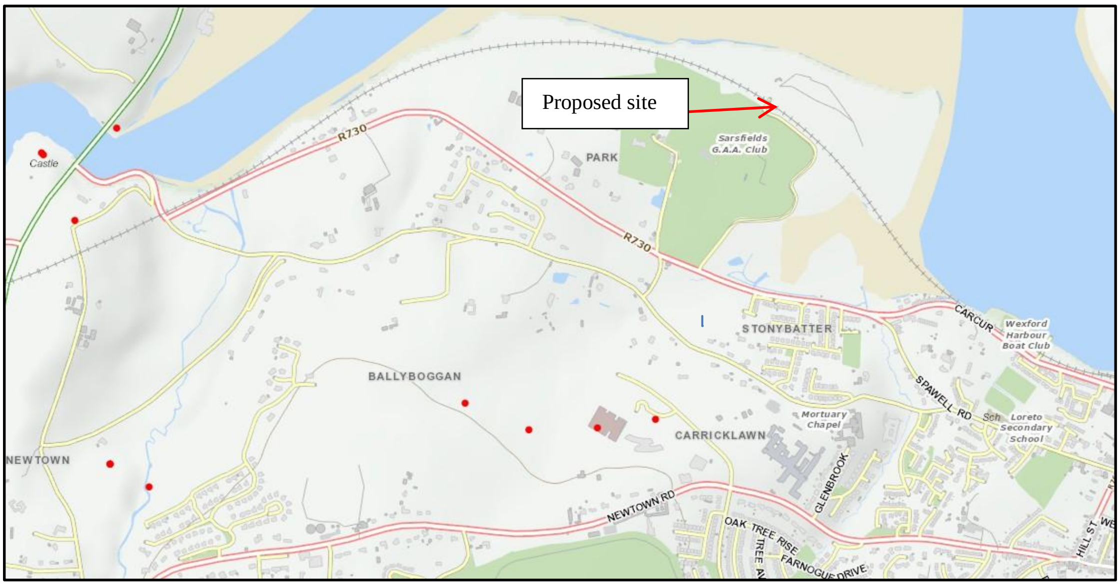

Fig. 12.1 Site location within extract from map at www.archaeology.ie showing the location of identified archaeological sites (marked as red dots) located in proximity to the proposed development site.

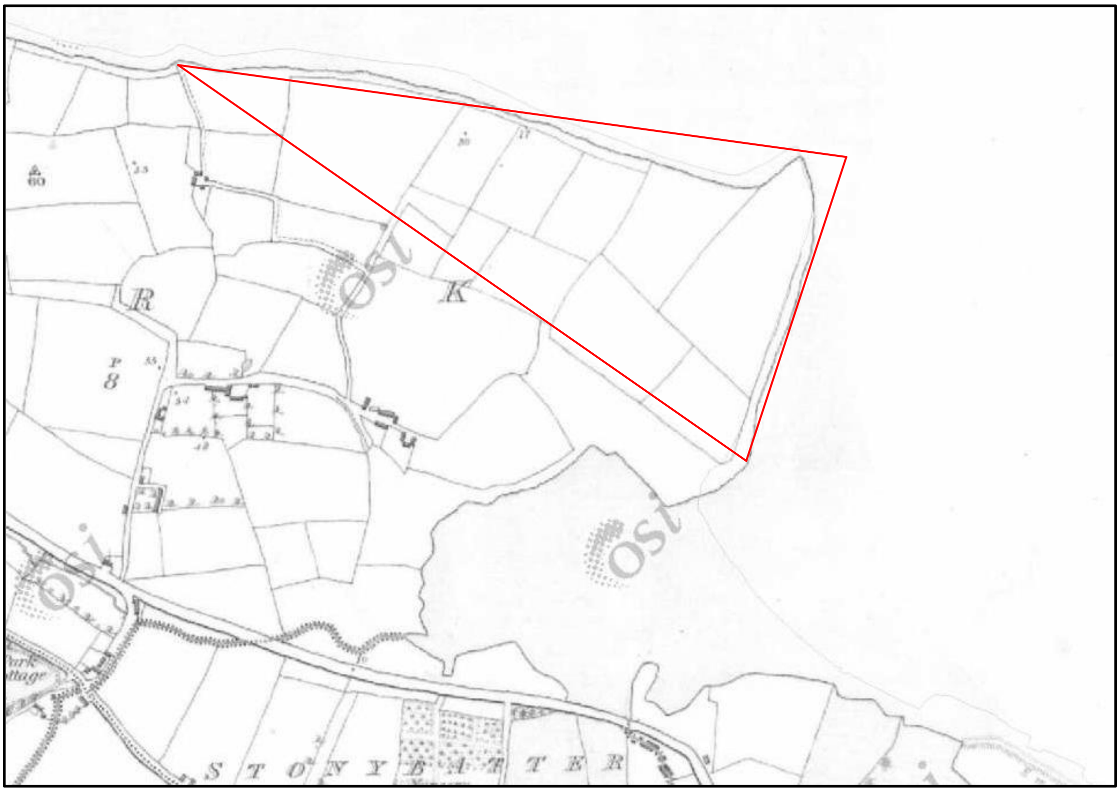

Fig. 12.2 Proposed development site within extract from 1841 first edition OS map.

Fig. 12.3 Layout of the proposed development site.

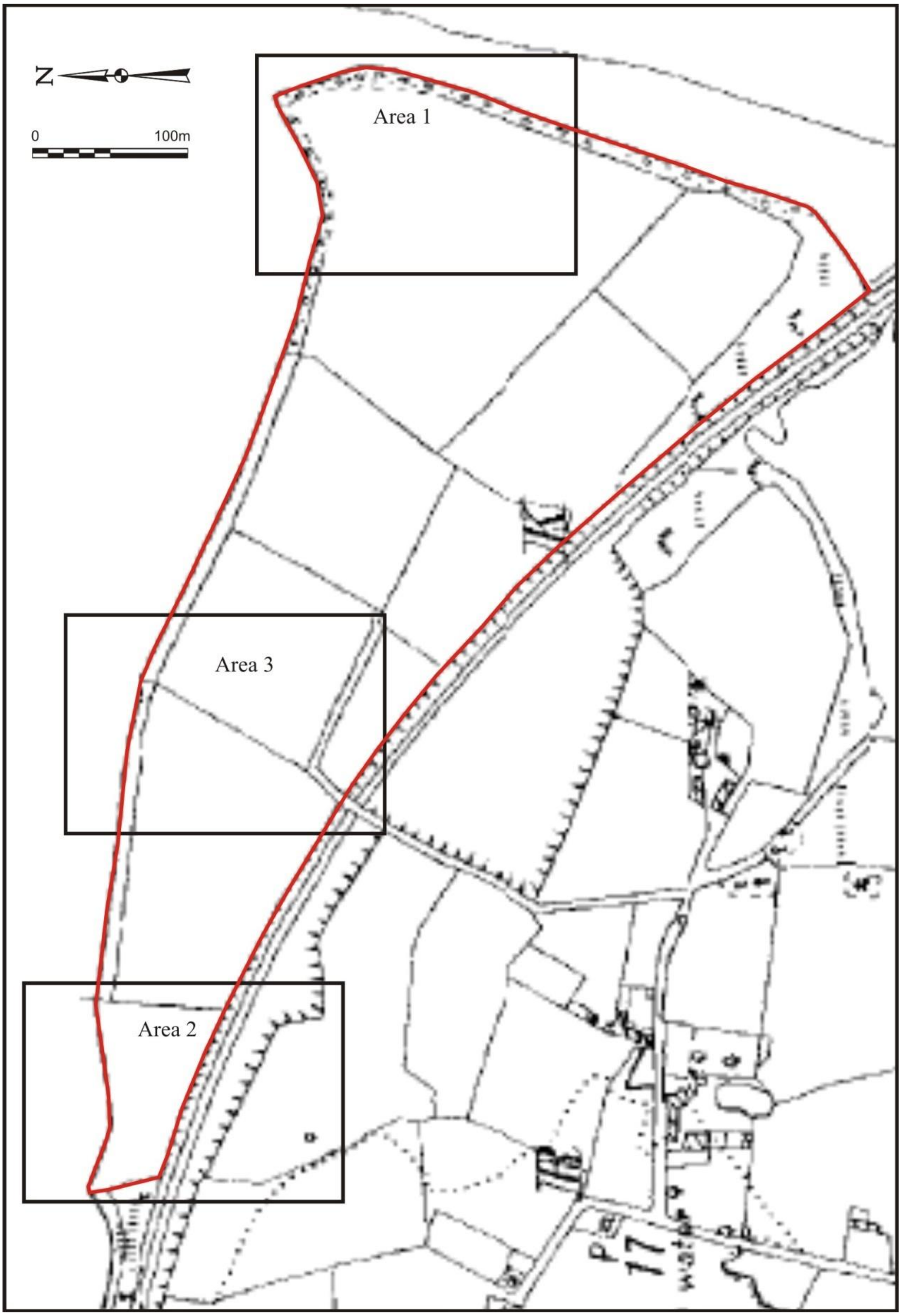

Fig. 12.4 Location of areas of archaeological testing.

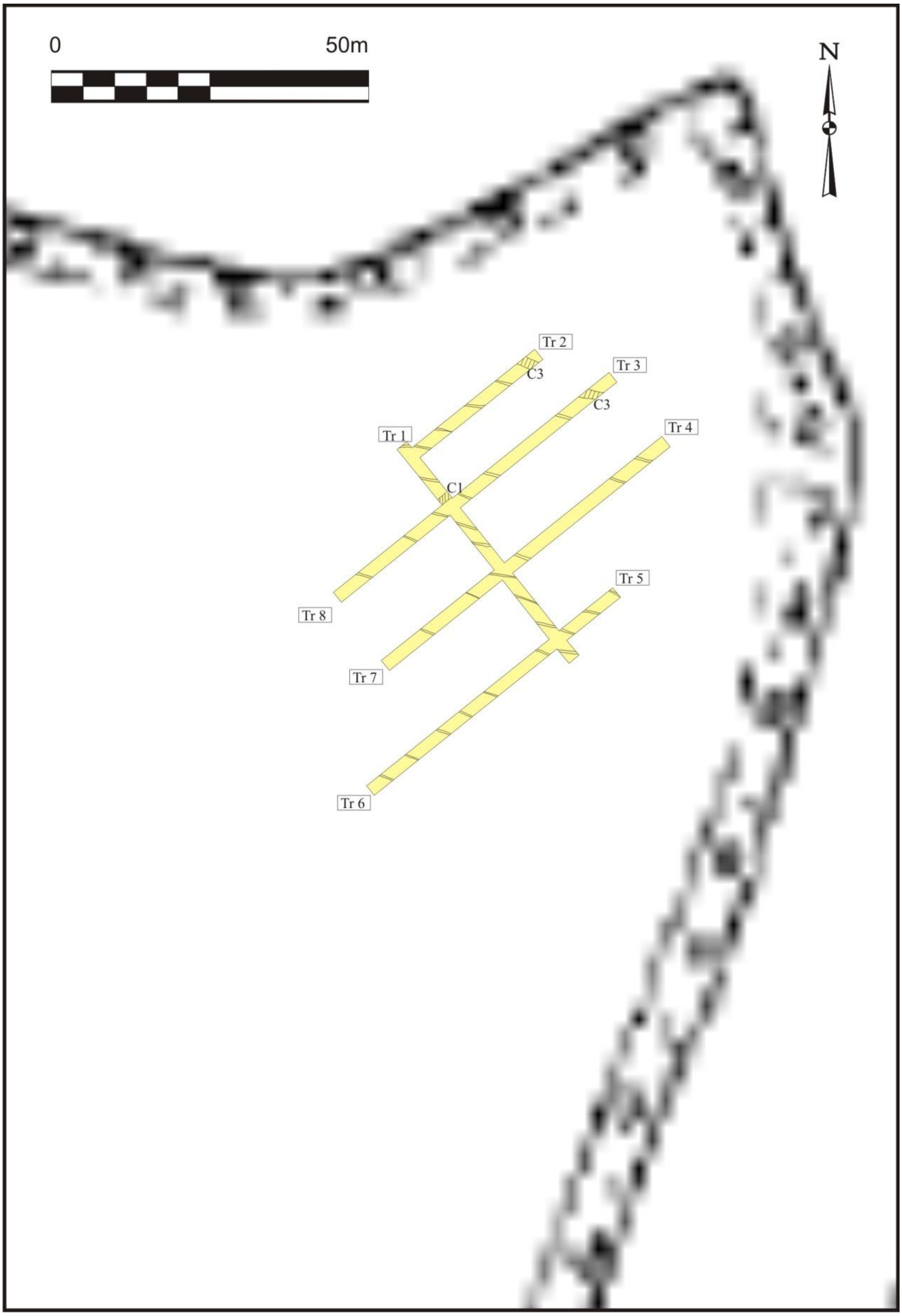

Fig. 12.5 Location and layout of test trenches in Area 1.

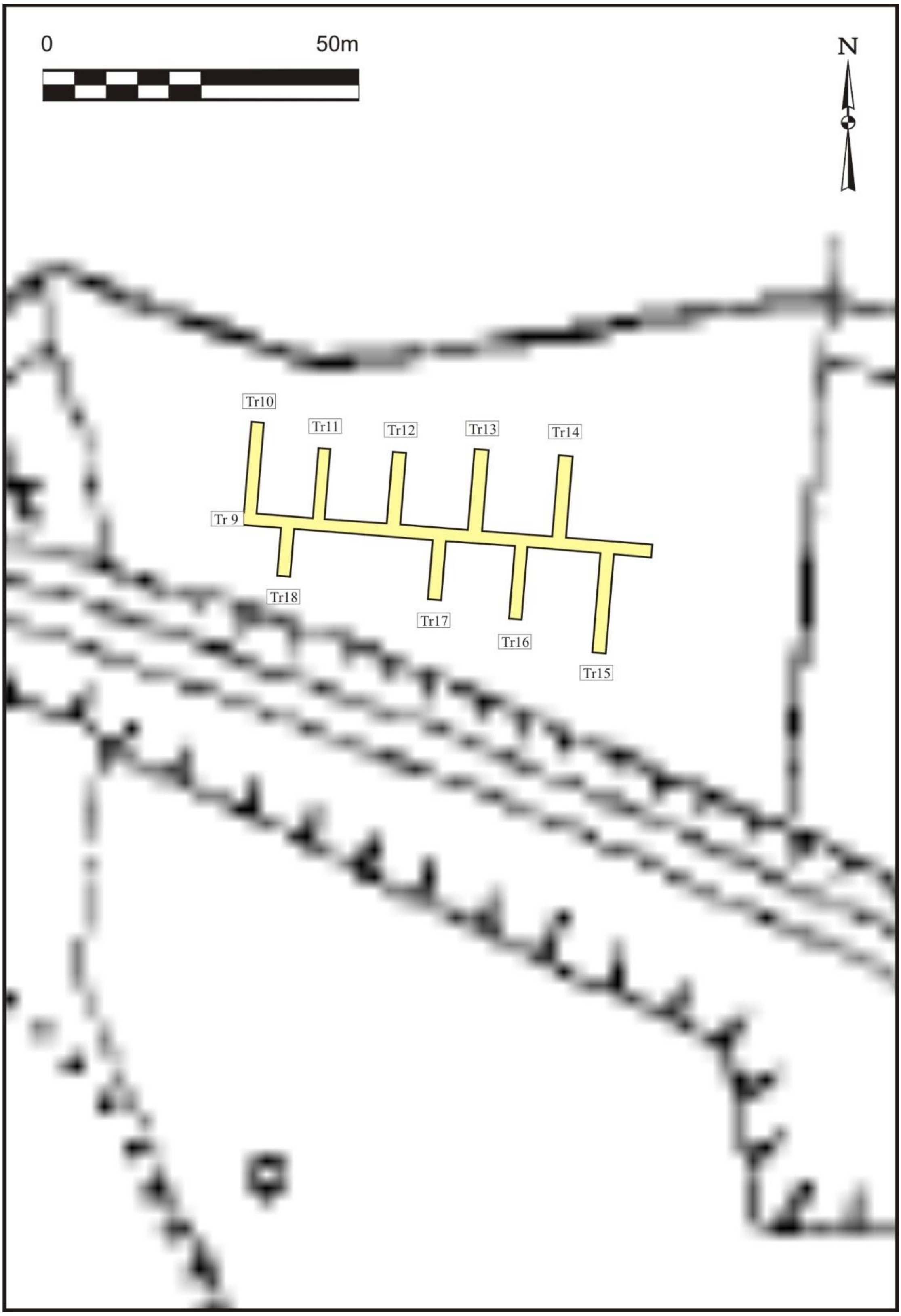

Fig. 12.6 Location and layout of test trenches in Area 2.

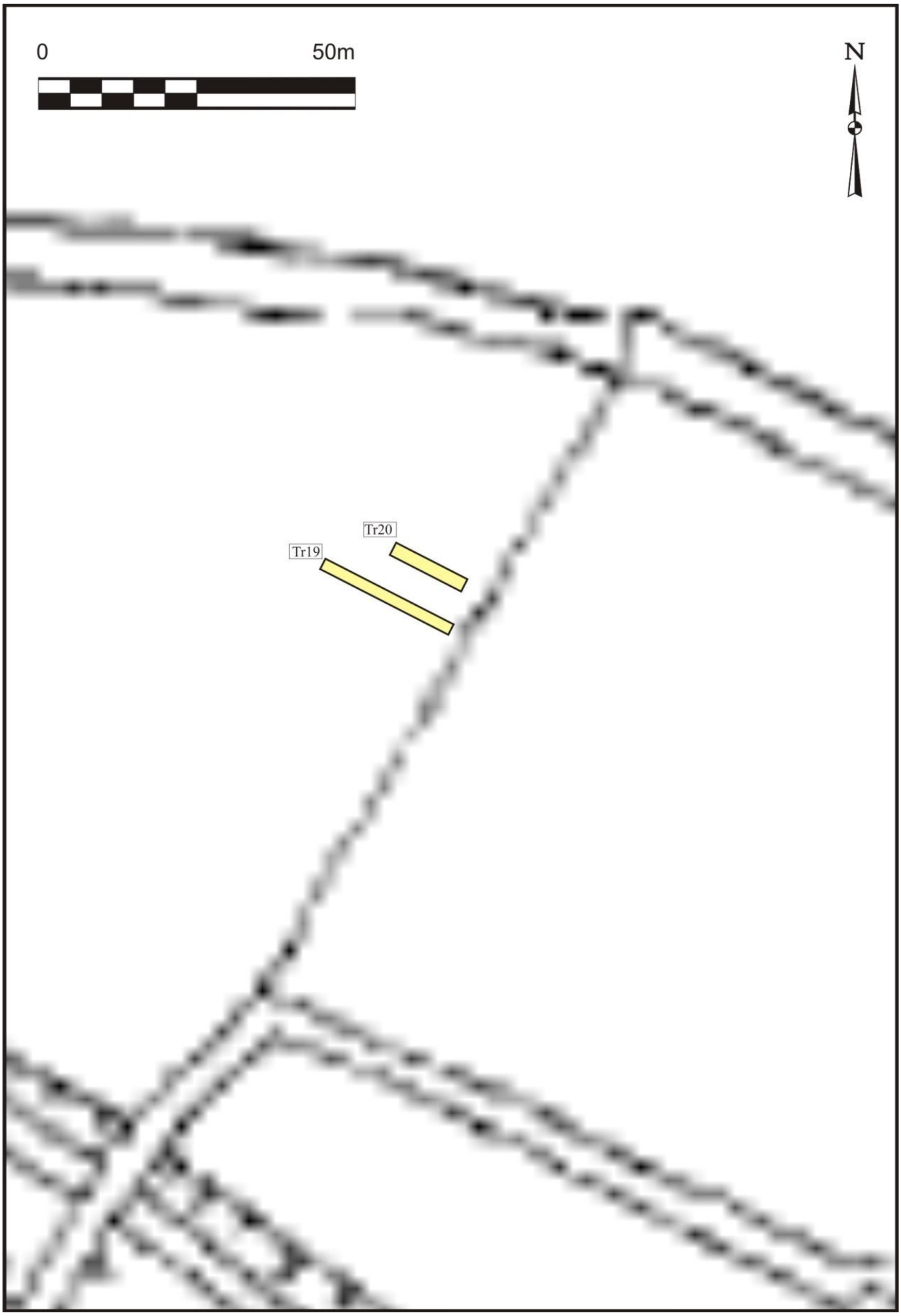

Fig. 12.7 Location and layout of test trenches in Area 3.

Pl 12.0 Development site looking east; main area has been entirely quarried out.

Pl 12.1 Remains of quarry.

Pl 12.2 Foreshore area at NW edge of development site.

Pl 12.3 Foreshore area at NE side of development site.

Pl 12.4 Remains of shellfish from fish processing at the quarry.

Pl 12.5 Area 1 Trench 1, looking south-east.

Pl 12.6 Area 1 Trench 1looking east.

Pl 12.7 Area 1 Excavated test trenches.

Pl 12.8 Area 2 Trench 1 looking east.

Pl 12.9 Area 2 Trench 4 looking north.

Pl 12.10 Area 2 View of excavated trenches.

Chapter 13 Interaction with the forgoing

13.0 Introduction

The purpose of this chapter is to identify and draw attention to significant 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 master-planning process. As members of the design team contributed to this EIAR, detailed elements of the scheme evolved. For example, the hydrological assessment resulted in raising the level of the site to three metres, the establishment of the need for a hard boundary around the otter habitat informed both the open space provision and the landscaping type, 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 asses significant interactions.

Table 13.0

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

13.3 Description and Assessment of Interactions

The following tables highlight the significant interactions that occur between topics addressed by this EIAR and rate the outcome of those interactions employing the above criteria.

Table 13.1 Population and Human Health		
	Description of Interaction	**Impact *Significance***
Biodiversity	Increased human activity in the area has the potential to impact negatively on habitats and species associated with the adjacent SAC and SPA. To avoid any potential negative impacts prior to construction, a berm and 5 temporary siltation ponds shall be employed (10m buffer) to prevent any silt or soil entering the estuary. During the operational stage, and on completion of construction, the berm shall be removed. (See Engineering Drawings PL 11 and PL 12) Retaining walls where required, will be construction before the berm is in place. Boundary planting with a fence will replace the berm. Direct access to the shoreline will not be permitted during construction or operation. An ecologist will be appointed to the project to oversee the implementation of all mitigation measures. Pre-construction otter surveys will inform site-specific mitigation to avoid significant disturbance to otters. Detailed construction method statements will be drawn up for site infill and construction to avoid damage to scrub/hedgerow habitat along the otter boundary.	Neutral *Not Significant*
Soils, and Geology & Water	In order to develop the site levels must be increased to 3m. A Site Specific Flood Risk Assessment has been prepared to address this and no significant impact is anticipated as a result of raising the level of the site. Potential displacement of flood waters during a 1 in 1000 year (0.1% AEP – Annual Exceedance Probability tidal flood event) is negligible given the massive volumes of water conveyance by the Slaney during an extreme 0.1% AEP tidal flood event.	Neutral *Slight*

	Potential gas migration from the old landfill site in close proximity to the subject site is currently being monitored and will continue to be monitored through all stages of development. If monitoring determines that migration is occurring it is proposed to finalise the measures to be employed and their real extent in conjunction with the County Council, and to obtain their final approval, before construction commences on site.	Neutral *Imperceptible*
	As previously stated a berm will be constructed around the perimeter of the site prior to construction to prevent contamination of the estuary during construction (detailed construction and phasing drawings are included as part of the engineering details). The berm shall remain in palace until the development is complete. During construction phase surface water shall be retained on site in holding ponds on a phase by phase basis. During operational phase surface water will be attenuated on site (1:100 year flood event) and discharged to the estuary with no aquaculture impact.	Neutral *Not Significant*
Air Quality & Climate	While construction dust tends to be deposited within 200m of a construction site, the majority of the deposition occurs within the first 50m. There are sensitive receptors, predominantly residential properties, in close proximity to the site. A series of mitigation measures are proposed in the form of a dust minimisation plan and construction management plan. If they are adhered to, the air quality impacts during the construction phase should be not be significant.	Neutral *Not Significant*
	Construction vehicles, generators etc., may give rise to some CO_2 and N_2O emissions. However, due to the short-term and temporary nature of these works the impact on climate will not be significant.	Neutral *Slight*
Noise and Vibration	The potential for vibration levels to be experienced in the vicinity of neighbouring residences during the construction phase is limited to construction vehicles and will not be detectable at the closest residence.	*Slight*
	In addition to the outward impacts of the proposed development, it is prudent to examine the potential inward noise arising from existing noise sources, in particular the railway track located to the west of the development. The nearest proposed dwellings will be located at approximately 10meters distance from the trackside. Subject to mitigation outlined in Chapter 9, inward noise impacts will be negligible.	Neutral *Slight*
Material Assets		Neutral *Not significant*

	Some interactions occur between Air Quality and Human Health with regards to traffic generated by the proposed development. This is addressed by table 13.4	
Cultural Heritage (Archaeology)	No significant interactions	Neutral *Imperceptible*
Landscape (visual Impact)	No significant interactions	Neutral *Imperceptible*

Table 13.2 Biodiversity		
	Description of Interaction	**Impact**
Population and Human Health	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*
	A pre-construction botanical survey will be carried out between May and September to re-survey the site for the occurrence of rare and/or protected flora. Should any protected flora or additional records for rare species be found, appropriate mitigation will be devised in consultation with NPWS, and under licence if required, to translocate the species to suitable receptor sites within or adjacent to the development site.	Neutral *Not Significant*
	The proposed lighting scheme has been designed using directional LED lighting, avoiding excessive illumination of the boundary habitats.	Neutral *Not Significant*
Soils, and Geology & Water	Potential impacts from this development to the aquatic habitats and species of the Slaney River Valley SAC primarily relate to potential threats to estuarine and transitional water quality as a result of the construction activities or storm water discharges, arising from the development, into the estuary waters. Pollution of groundwater during construction at the site could also impact on estuarine waters. Pollution of surface or groundwater could arise as a result of fuel leakages from machinery and inappropriate use or disposal of hazardous chemicals including paints, solvents etc. Inadequate control of surface water run-off during construction earthworks could result in sediment transfer to the estuary.	Neutral *Not Significant*

	Detailed mitigation measures to avoid negative impacts to water quality are included in the NIS and construction management plan. There will be no deterioration in groundwater or surface water quality as a result of this development and consequently no impact to aquatic habitats or species. Siltation ponds (5 in total) will be employed on site during construction to prevent surface water entering the estuary.	
Air Quality & Climate	No significant interaction	Neutral *Imperceptible*
Noise and Vibration	No significant interaction	Neutral *Imperceptible*
Material Assets	Minor interactions occur between Biodiversity and Traffic generated by the proposed development. See Table 13.4	Neutral *Not Significant*
Cultural Heritage (Archaeology)	No significant interactions	Neutral *Imperceptible*
Landscape (visual Impact)	Landscaping proposals have been adapted to provide as much natural habitat as possible to replace habitat removed by the proposed development.	Neutral *Not Significant*

Table 13.3 Soils, and Geology & Water		
	Description of Interaction	**Impact**
Population and Human Health	Potential impacts to the underlying soil and geological environment could derive from accidental leakage of hydrocarbon fuels or oils from vehicles and/or machinery on site during construction. In addition, the spillage and inappropriate disposal of any potentially hazardous substances (for example fuels or oils) on site could adversely impact on the surrounding groundmass. Discarded equipment can also potentially contain materials which could lead to contamination of the underlying soil environment. Accidental spillage of oil and chemicals during construction would be contained and cleaned up using materials and equipment stored on site near the point of use. In the event of contamination of soil due to a spillage spreading outside the storage annexe or occurring elsewhere, any soil so contaminated will be removed for proper disposal off-site.	Neutral *Slight*

Biodiversity	Prior to construction commencing, detailed construction method statements will be drawn up in consultation with NPWS and Inland Fisheries Ireland (IFI) and approved. This will include best practice construction site management and specific mitigation measures to control construction site drainage and sediment run-off in order to avoid any transfer of sediments or pollution to the estuarine waters or to groundwater. As previously stated a berm will be in place along the waters edge during construction to prevent the contamination of the estuary via imported material or construction activity. Temporary settlement ponds will be employed to manage surface water. Siltation of local surface water bodies will be avoided by the construction of 5 temporary settlement ponds during construction and careful site surface water management. Soils will be saved from existing gravel areas on site and reused to recreate sand/gravel habitat adjacent to the site.	Neutral *Not Significant*
Air Quality &Climate	No significant interactions	Neutral *Imperceptible*
Noise and Vibration	No significant interactions	Neutral *Imperceptible*
Material Assets	To prevent contaminants entering nearby shellfish waters, all storm water from the development will be collected from impervious surfaces routed through petrol interceptors and infiltrated into the ground through soakaways	Neutral *Not Significant*
Cultural Heritage (Archaeology)	No significant interactions	Neutral *Imperceptible*
Landscape (visual Impact)	No significant interactions	Neutral *Imperceptible*

Table 13.4 Air Quality & Climate		
	Description of Interaction	**Impact**
Population and Human Health	Emissions of pollutants from road traffic can be controlled most effectively by either diverting traffic away from heavily congested areas or ensuring free flowing traffic through good traffic management plans	

	The proposed development will deliver key transport objectives of the Development Plan including the potential for a third river crossing. Air dispersion modeling carried out as part of this assessment (Chapter 8) indicate that the residual impacts of the proposed development on air quality and climate are predicted to be imperceptible with respect to the operational phase local air quality assessment for the long and short term.	Neutral *Not Significant*
Biodiversity	There will be a negligible increase in NO_2 levels within the Slaney River SAC and Wexford Slobs and Harbour SPA for NO_2 dry deposition due to the proposed development.	Neutral *Not Significant*
Soils, and Geology & Water	Monitoring of gas levels from the former landfill for methane gas levels will take place before, during and after construction.	Neutral *Not Significant*
Noise and Vibration	No significant interactions	Neutral *Imperceptible*
Material Assets	Improvements in air quality are likely over the next few years as a result of the on-going comprehensive vehicle inspection and maintenance program, fiscal measures to encourage the use of alternatively fuelled vehicles, and the introduction of cleaner fuels.	Neutral *Not Significant*
Cultural Heritage (Archaeology)	No significant interactions	Neutral *Imperceptible*
Landscape (visual Impact)	No significant interactions	Neutral *Imperceptible*

Table 13.5 Noise and Vibration		
	Description of Interaction	**Impact**
Population and Human Health	The nearest noise sensitive receptors to the site boundary are dwelling houses located approximately 200 metres to the south of the site. There will be noticeable noise events during construction. The predicted noise levels from all works are within the acceptable criterion of 65dB $L_{Aeq,1hr}$at the nearest receptor..Standard working hours of 08:00 to 18:00hrs Monday to Friday and 08:00 to 13:00hrs on Saturdays will be applied.	Neutral *Not Significant*

	The main potential source of vibration during the construction programme is associated with piling, demolition and ground breaking activities, where required. Considering the low vibration levels at close distances to the piling rigs (10m), vibration levels are not expected to pose any significance in terms of cosmetic or structural damage to any of the buildings adjacent to the development (200m). In addition, the range of vibration levels is typically below a level which would cause any disturbance to occupants of adjacent buildings.	Neutral *Not Significant*
Biodiversity	A range of noise levels have been identified as potentially causing disturbance to waterbirds. Section 6.4.3 concludes that construction noise is unlikely to cause significant disturbance impacts to any of the waterbird species covered by this assessment.	Neutral *Not Significant*
Soils, and Geology & Water	No significant interactions	Neutral *Imperceptible*
Air Quality & Climate	No significant interactions	Neutral *Imperceptible*
Material Assets	The assessment has shown that no mitigation will be required in respect of additional road traffic on public roads.	Neutral *Not Significant*
Cultural Heritage (Archaeology)	No significant interactions	Neutral *Imperceptible*
Landscape (visual Impact)	No significant interactions	Neutral *Imperceptible*

Table 13.6 Material Assets Traffic Impact		
	Description of Interaction	**Impact**
Population and Human Health	Some interactions occur between Air Quality and Human Health with regards to traffic generated by the proposed development. This is addressed by Table 13.4	Neutral *Not Significant*
Biodiversity	There will be a negligible increase in NO_2 levels within the Slaney River SAC and Wexford Slobs and Harbour SPA for NO_2 dry deposition due to the proposed development.	Neutral *Not Significant*

Soils, and Geology & Water	No significant interactions	Neutral *Imperceptible*
Air Quality & Climate	Interactions occur between air quality and traffic generated by the proposed development see Table 13.4.	Neutral *Slight*
Noise and Vibration	Although there will be 6dB increase due to the site access, the level of noise arising from the existing R730 is such that the cumulative increase in noise levels will be of the order of 1dB. Therefore the impacts of additional road traffic noise as a result of the proposed development will be negligible.	Neutral *Not Significant*
Cultural Heritage (Archaeology)	No significant interactions	Neutral *Imperceptible*
Landscape (visual Impact)	No significant interactions	Neutral *Imperceptible*

Table 13.7 Cultural Heritage (Archaeology)

	Description of Interaction	**Impact**
Population and Human Health	No significant interactions	Neutral *Imperceptible*
Biodiversity	Monitoring will take place during construction of all aspects of the foreshore habitat protection boundary.	Neutral *Not Significant*
Soils, and Geology & Water	Monitoring will take place during initial site clearance works	Neutral *Not Significant*
Air Quality & Climate	No significant interactions	Neutral *Imperceptible*
Noise and Vibration	No significant interactions	Neutral *Imperceptible*

Material Assets	No significant interactions	Neutral *Imperceptible*
Landscape (visual Impact)	Of the 3 areas surveyed (details in Chapter 12) Area 2 and 3 did not contain any archaeological material. Area 1 contained an apparently post-medieval field system plus a possible linear feature of unknown date. The proposals for the development are to retain Area 1 as an undeveloped green space. There will therefore be no impact to the features in Area 1	Neutral *Not Significant*

Landscape (Visual Impact)		
	Description of Interaction	**Impact**
Population and Human Health	Construction of the development will add machinery, material depots, noise and dust to the landscape. But these will be Temporary impacts. Impacts of a temporary nature also draw attention to the works thereby increasing the visual disturbance experienced by users, resulting in a Moderate, Temporary impact. The development introduces new structures that alter the landscape character of the area and become a permanent part of the landscape. The visual Impact Assessment included in Chapter 10 of this EIAR concludes that the preceded level of impacts are by and large localised to certain viewpoints. Views directly to the site, are softened by the topography, existing vegetation and backdrop, which help mitigate against visual impact. Those views that are Moderate offer fleeting glances. Mitigation measures will help soften these impacts over time, as vegetation and planting matures, and the buildings settle into the landscape. Distant Views will be Slight to Imperceptible and be generally neutral in effect.	Negative *Moderate* (Temporary) Neutral *Slight*
Biodiversity	The design of this development has incorporated a minimum 10 m buffer from the bank/shoreline within which the vegetation (hedgerow, scrub and grass areas) will be retained and enhanced with supplemental planting. An otter pond (fenced off to prevent public access) will be created. The design of the pond has been informed by best practice construction methodology for wildlife ponds. Water levels in the pond will be maintained by a feed of clean pollution free freshwater. It will be planted with native aquatic plant vegetation.	Neutral *Slight* Positive *Slight*

	The landscaping plan provides for native hedgerow and tree planting which in time as they mature will provide nesting habitat and forage for some bird species. The landscaping plan provides for areas of wildflower meadows which will provide cover and a foraging source for some bird species.	Positive *Not Significant*
	An invasive plant species management plan will be drawn up and implemented by an invasive plant species specialist to treat and prevent the spread of the invasive plants species on site	Neutral *Not Significant*
Soils, and Geology & Water	Topsoil removed will be re-used in landscaping of green areas of the development, so the net loss would be minimised, and a considerable amount of ground previously stripped will be reinstated with topsoil.	Neutral *Not Significant*
Air Quality & Climate	No significant interactions	Neutral *Imperceptible*
Noise and Vibration	No significant interactions	Neutral *Imperceptible*
Cultural Heritage (Archaeology)	No significant interactions	Neutral *Imperceptible*
Material Assets	No significant interactions	Neutral *Imperceptible*

13.3 Conclusion

It is concluded that the proposed development will not result in any significant or cumulative adverse impacts on the environment. The proposal will not result in any significant individual adverse effects on the environment, and as such the environmental impact of the proposed development is acceptable.

14.0 SUMMARY OF MITIGATION MEASURES

In the interest of clarity and for ease of reference, mitigation measures contained in this EIAR relative to respective chapters have been summarised below. All measures included below form part of the proposed development and will be implemented in full.

14.1 Population & Human Health

The mitigation measures outlined in the Population and Human Health chapter will minimise and/or eliminate the potential for adverse impacts on the local community and amenities. Working hours should consider the peak use of adjacent playing fields and should be agreed with the council in full as part of the construction management plan.

The development has been designed in four self contained phases with balanced provision in terms of house design and unit type. Crèche facilities are provided as part of phase 2 to cater for phases 1 and 2 and phase 4 to cater for phases 3 and 4. Social affordable housing is also distributed evenly across phases of development.

With regards to construction traffic, the phasing of the scheme has been designed to avoid scenarios where construction traffic associated with future phases of development will have to pass through completed phases of development. This has been achieved through the use of two site entrances. Following completion and occupation of phase one a dedicated construction traffic entrance will be provided to reduce the potential for conflict with residential traffic. A construction traffic management strategy will be agreed in full with the Local Authoriety as part of the Construction Management Plan.

The mitigation measures in relation to, noise, vibration, water, air and dust quality and landscaping as set out in this EIAR will be implemented in full to minimise impacts on adjacent residents and users of the adjoining open space.

14.2 Biodiversity

Mitigation measures by design or otherwise are included in the NIS which address any potential impacts to the Slaney River Valley SAC and the Wexford Harbour and Slobs SPA and The Raven SPA. These mitigation measures will be implemented in full. These mitigation measures are detailed in the NIS and are summarised below along with additional measures to mitigate potential impacts to other species.

A Project Ecologist will be appointed to the project during all construction phases to oversee the implementation of the mitigation measures incorporated into this development.

14.2.1 Prevention of pollution of water courses

Prior to development commencing, detailed construction method statements will be drawn up and agreed with NPWS and Inland Fisheries Ireland (IFI). The construction method statements will include:

- Construction of a retaining wall along the shoreline site boundary to retain the infill soils on site.

- Construction of a temporary 1 m high berm with 1 in 3 side slope along the full length of the eastern and northern boundary of the site to prevent escape of silty water to the estuary and guide it to temporary siltation ponds as outlined in engineering drawing PL12.
- Best practice construction site management and specific measures to avoid any transfer of sediments or pollution to the estuarine waters or to groundwater

14.2.3 Mitigation of potential habitat loss and disturbance to otter and wintering birds during the construction and operational phases

- Prior to development commencing, a new freshwater pond will be constructed in the northeast corner of the site. The pond will be monitored and use of the pond by otters confirmed prior to infilling of the existing pond.
- Prior to site infill a method statement outlining protection of the otter habitat during site infill will be drawn up and approved by NPWS
- Prior to construction commencing, a preconstruction otter survey will take place to identify any changes in otter activity and holt locations since the otter survey. The preconstruction survey will take place no more than 10-12 months in advance of construction.
- This preconstruction otter survey will be supplemented by a further inspection of the development area, immediately prior to site clearance to ensure that no new holts have been created in the intervening period and to check if any of the previous identified potential holts are in active use by breeding females or have otter cubs present.
- The preconstruction otter survey will inform site-specific measures to avoid disturbance to otter at the time of construction following NRA guidelines *The Treatment of Otters Prior to the Construction of National Road Schemes* (NRA,2006) and other guidance as relevant.
- A constructed berm will be established along the shoreline at the 10-15 m buffer line established as otter habitat and shall remain in place for the entirety of the construction phase.
- Temporary or permanent fencing shall be erected along the constructed retaining wall for each phase of the development to protect the otter habitat and screen the development from the shoreline where gaps in the vegetation exist.
- Vegetation removal to facilitate the construction of the retaining wall and the construction of the outfall pipes will be replaced immediately with hedgerow planting of native species including hawthorn, blackthorn and/or gorse.

- Security fencing will be erected for each phase of the development to prevent access by the public to the shoreline until the permanent shoreline fence line is complete for the entire development.
- The construction of the outfall pipes and any work carried out on the shoreline or mudflats will be restricted to summer months during May to August inclusive
- Security and construction work lighting will be set up to avoid illumination of the otter habitat and the shoreline habitats and will follow appropriate guidelines including but not limited to:
    - Guidance Notes for the Reduction of Obtrusive Light GN01 (Institute of Lighting Professionals, 2011
    - Bats & Lighting - Guidance Notes for Planners, Engineers, Architects and Developers (Bat Conservation Ireland, December 2010)
    - Bats and Lighting in the UK – Bats and the Built Environment Series, Bat Conservation Trust UK
- The development will be permanently fenced along the boundary with SAC/SPA including the shoreline, reedbed and woodland within the SAC preventing public access by people or dogs during the operational phase.
- The vegetation at the boundary of the development will be enhanced by native planting to increase the screening effect of the shoreline habitats by the existing vegetation.

14.2.4 Mitigation measures to prevent the spread of invasive plant species

An invasive species management plan will be drawn up by an experienced invasive plant species specialist and agreed with the NPWS prior to the commencement of construction.

The invasive species management plan will:

- Identify and map all locations of Japanese knotweed, three-cornered leek and winter heliotrope within the site.
- Establish exclusion zones around the invasive plant species to prevent incursion by construction vehicles and personnel onto areas containing invasive plant species
- Present control and eradication options for the treatment of invasive plant species in particular Japanese knotweed and three-cornered leek
- Implement appropriate measures to treat and prevent the spread of the invasive plant species within or outside of the site during all the construction phases.
- Monitor undeveloped areas between phases of development for the growth of invasive plant species including Japanese knotweed, three-cornered leek, winter heliotrope and other invasive plant species and carry out appropriate treatment (removal or control with herbicide) by a suitability qualified contactor certified in the professional use of pesticides.
- Post construction monitoring of the site to check for re-establishment of the species on the site

14.2.5 Mitigation of the loss of habitats and flora onsite include:

- A pre-construction botanical survey will be carried out between May and September to re-survey the site for the occurrence of rare and/or protected flora. Should any protected flora or additional records for rare species be found, appropriate mitigation will be devised in consultation with NPWS and under licence if required to translocate the species to suitable receptor sites within or adjacent to the development site.
- The pre-construction botanical survey will record the frequency and diversity of all plant species in the sand and gravel habitat as baseline data prior to removal of the habitat.
- Prior to infilling or clearance of the site, sand and gravel from the exposed sand and gravel (ED1) habitat on site will be excavated and the soils saved and used to create a sand and gravel flat area with a south facing embankment adjacent to the northern boundary of the development and around the otter pond to create replacement to create replacement sand and gravel habitat.
- These areas will be fenced off from the development site preventing disturbance to the habitat. The habitat will be maintained annually by a 3 year cycle of rotational strimming and removal of the vegetation and manual disturbance by light scarification to prevent encroachment by scrub species. Maintenance of the habitat will be incorporated into the landscaping management plan.
- The landscape plan includes planting of native hedgerows and trees along the boundary of the site to enhance the boundary vegetation.
- The landscape plan includes planting of native and non-native hedgerow and trees species within the amenity and parkland areas within the development

14.2.6 Mitigation of potential impacts to bat species.

- Prior to site clearance, a pre-construction bat roost survey of buildings and trees scheduled for removal will take place to inform site specific mitigation measures to reduce or avoid impacts to bats during site clearance. The bat survey methodology should have regard for Bat Surveys: Good Practice Guidelines, 3rd edition, Bat Conservation Trust (Collins, 2016) and the *Bat Tree Habitat Guide* (BTHG 2018).
- A precautionary working methodology will be implemented under derogation licence if necessary during tree felling under the supervision of the project ecologist to avoid direct harm or significant disturbance to bat roosts
- During construction, security and construction lighting will be sensitive to prevent illumination of the otter habitat and shoreline habitats during construction which will also avoid illumination of retained bat habitat at the boundary of the site.
- To mitigate the loss of potential roost features bat boxes (2F Schwegler Bat Box or similar woodcrete boxes) should be installed in the retained trees at the margins of the site. The number and location of bat boxes should be determined by the project ecologist dependant on the results of the preconstruction surveys and the availability of suitable retained trees for the installation of bat boxes.

- The proposed lighting scheme is designed to ensure that the lighting around the perimeter of the development is directional to prevent overspill onto the shoreline and treeline habitats along the rail line.

14.2.7 Mitigation for terrestrial birds

- Site clearance and/or infilling of the site, will take place outside of the breeding season (which occurs between March 1st to August 31st inclusive) to avoid direct injury and disturbance to breeding birds. If this is not possible then a breeding bird survey will be carried out on any areas to be cleared and site specific mitigation measures put in place in consultation with the NPWS to ensure compliance with the Wildlife Act 2000 (as amended).
- Retention of hedgerow and scrub along the boundaries of the site will retain a significant portion of habitat suitable for terrestrial bird species.
- The landscaping plan provides for native hedgerow and tree planting which in time as they mature will provide nesting habitat and forage for some bird species.
- The landscaping plan provides for areas of wildflower meadows which will provide cover and a foraging source for some bird species.
- In time, gardens associated with the development are expected to provide suitable habitat for some garden bird species.

14.2.8 Mitigation for lizards

Landscaping proposals include features specifically included to provide suitable habitat for lizards.

- Wildflower meadow areas to provide long grass and tussocks for basking and a source of insect prey.
- Varied topography to provide south facing surfaces for basking.
- Rocky outcrops to provide to provide hibernacula and basking sites.
- South facing sand and gravel embankment to provide basking sites.
- Hedgerow planting to provide areas of shelter.
- Gardens are expected to provide some resources for lizards.

14.2.9 Mitigation measures for invertebrates

- Sand and gravel will be saved and used to create a south-facing sand and gravel embankment along the northern boundary of the western portion of the site. An additional area of sand and gravel banks will be created near the new pond. These areas will be fenced off from the development site preventing disturbance to the habitat. The habitat will be maintained annually by a 3 year cycle of rotational strimming and removal of the vegetation and manual disturbance in autumn/winter by light scarification to prevent encroachment by scrub species.

- Wildflower meadow areas incorporated into the amenity areas of the development will provide suitable foraging resources.
- Native hedgerow and tree planting will provide additional nectar sources for pollinating insects.
- Flower beds and borders within the landscaping and gardens of the development will provide additional feeding resources for insects.

14.3 Soils, Geology & Water

14.3.1 Soils and Geology

Increase in soil moisture content, saturation of soil and erosion due to overflow from drains will be avoided by the provision of an adequate amount of new drains where necessary, and by avoiding placing large amounts of wet soil into bunds or storage mounds during construction.

Accidental spillage of oil and chemicals during construction would be contained and cleaned up using materials and equipment stored on site near the point of use. In the event of contamination of soil due to a spillage spreading outside the storage annexe or occurring elsewhere any soil so contaminated will be removed for proper disposal off-site.

Redundant equipment and machinery used during construction will be removed from site and disposed of in an appropriate manner using legal, regulated waste disposal facilities.

Siltation in local surface water bodies, drainage ditches and streams will be avoided by the construction of temporary settlement ponds during construction and careful site surface water management.

Significant importation of fill is required as shown on Arthur Murphy & Co Engineering Drawings PL 10. The imported fill will be from greenfield sites in the vicinity of Wexford town and will be clean and inert. It will comply with relevant environmental and planning regulations. Industry standard screening and monitoring will be carried out to ensure that non-inert or potentially contaminated material is not placed on site.

A berm shall be constructed along the river edge inside the otter boundary which is a minimum of 10m from the river edge.

14.3.2 Water

- It is proposed to raise the existing ground levels within the site area to a minimum level of 2.95m OD, which is equal to the predicted 1 in 1000 year (0.1% AEP) High End Future Scenario tidal flood level in the vicinity of the site. This level of 2.95m OD is 1m above the 1 in 1000 year tidal flood level for the Current Scenario.
- It is recommended that the finished floor levels are constructed a minimum of 0.3m above the predicted 1 in 1000 year tidal flood level (0.1% AEP) for the High End Future Scenario, i.e. 2.95 + 0.3m = 3.25m OD (Malin).
- It is recommended that any existing or proposed surface water pipes or culverts within the site boundary are fitted with appropriately designed tidal flap valves.

14.3.3 Gas

Should monitoring indicate that gas migration is occurring it is proposed to finalise the measures to be employed and their areal extent in conjunction with the County Council, and to their final approval, before construction commences on site.

This approach has been agreed with Wexford Council.

The measures and their extent will be based on the Council's findings and the further monitoring for landfill gas within the proposed development site. A range of protection measures are outlined in Dept. of Environments 'Protection of New Buildings and Occupants from Landfill Gas', published in 1999. The measures to be adopted will comply appropriately with these.

An additional measure that can be considered would be to install an open textured rock filled trench at an agreed location and to an agreed extent to act as a cut-off trench. In view of the existence of the silt barrier mentioned above this trench is not likely to be required but is available as an option should the need arise.

In addition the standard radon barrier in dwellings may be upgraded and the buildings underlain with 200mm of granular fill vented to the open air for houses in any part of the site deemed to be at risk. The areal extent of the site requiring protection will also be agreed with Wexford County Council.

14.4 Air Quality Climate

14.4.1 Construction

In summary the measures which will be implemented will include:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads.
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site road, this will be 20 kph, and on hard surfaced roads as site management dictates.
- Vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust.
- Public roads outside the site will be regularly inspected for cleanliness, and cleaned as necessary.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

14.4.2 Operation

Air Quality

Mitigation measures in relation to traffic-derived pollutants have focused generally on improvements in both engine technology and fuel quality. EU legislation, based on the EU sponsored Auto-Oil programmes, has imposed stringent emission standards for key pollutants (REGULATION (EC) No 715/2007) for passenger cars which was complied with in 2009 (Euro V) and 2014 (Euro VI).

As outlined in TII (2011), the guidance states that “for the purpose of the EIAR, it should be assumed that pollutant concentrations will decline in future years, as a result of various initiatives to reduce vehicle emissions both in Europe and in Ireland” (Page 52). A range of legislation in Europe over the period 1992 – 2013 has significantly reduced the allowable steady cycle emissions of both NO_X and PM from road vehicles with NO_X emission reductions for HDV (Heavy Diesel Vehicles) a factor of 20 and PM a factor of 36 over this period (Euro I to Euro VI). In relation to LDV (Light Diesel Vehicles) the reduction of NO_X and PM from road vehicles has also been significant with NO_X emission reductions from HDV a factor of 12 and PM a factor of 40 over this period (Euro I to Euro VI). Although actual on-road emission reductions will be less dramatic, significant reductions in vehicle-related NO_X and PM emissions are to be expected over the next 5-10 years as the fleet turns over.

Emissions of pollutants from road traffic can be controlled most effectively by either diverting traffic away from heavily congested areas or ensuring free flowing traffic through good traffic management plans and the use of automatic traffic control systems (UK Department for Environment, Food and Rural Affairs, 2016b).

14.4.3 Climate

Improvements in air quality are likely over the next few years as a result of the on-going comprehensive vehicle inspection and maintenance program, fiscal measures to encourage the use of alternatively fueled vehicles and the introduction of cleaner fuels.

CO_2 emissions for the average new car fleet were reduced to 120 g/km by 2012 through EU legislation on improvements in vehicle motor technology and by an increased use of biofuels. This measure has reduced CO_2 emissions from new cars by an average of 25% in the period from 1995 to 2008/2009 whilst 15% of the necessary effort towards the overall climate change target of the EU has been met by this measure alone (Department of Environment, Heritage and Local Government, 2000).

Additional measures included in the National Climate Change Strategy (Department of Environment, Heritage and Local Government, 2006, 2007) include: (1) VRT and Motor Tax rebalancing to favour the purchase of more fuel-efficient vehicles with lower CO_2 emissions; (2) continuing the Mineral Oils Tax Relief II Scheme and introduction of a biofuels obligation scheme; (3) implementation of a national efficient driving awareness campaign, to promote smooth and safe driving at lower engine revolutions; and (4) enhancing the existing mandatory vehicle labelling system to provide more information on CO_2 emission levels and on fuel economy.

14.5 Noise Vibration

Construction Phase

14.5.1 Construction Noise Management

The contractor will also be obliged to give due regard to *BS5228-1:2009+A1:2014*, which offers detailed guidance on the control of noise from construction activities. In particular, it is proposed that various practices be adopted during construction, including:

- Limiting the hours during which site activities likely to create high levels of noise are permitted.
- Establishing channels of communication between the contractor, local authority and residents.
- Appointing a site representative responsible for matters relating to noise.
- Monitoring typical levels of noise during critical periods and at sensitive locations.
- Furthermore, it is envisaged that a variety of practicable noise control measures will be employed in addition to the maintenance of the propped acoustic screen, including:
  - Selection of plant with low inherent potential for generation of noise; and
  - Siting of noisy plant as far away from sensitive properties as permitted by site constraints.

14.5.2 Construction Noise and Vibration Management Plan

Due to the potential for construction noise impacts, it is recommended that the Contractor draw up and submit a Construction Noise and Vibration Management plan for submission to Wexford County Council.

This management plan should entail specific details of the procedures and measures that the contractor shall employ to ensure that noise limits outlined can be complied with.

14.5.3 Summary of Construction Noise Mitigation Measures

It is envisaged that once these mitigation measures are implemented that noise can be reduced to within the requisite noise limits as established in Section 9.2.1.

Operational Phase

14.5.4 Building Services Noise

All plant will be designed and installed to achieve a cumulative sound pressure level not exceeding 41dB $L_{Aeq,15minute}$ at the nearest noise sensitive receptors.

Where applicable, the following measures will be implemented as standard:

- All AHU's will be provided with requisite intake and exhaust attenuation;
- All condenser and chiller fans will be appropriately specified; and
- Acoustic screening will be installed where necessary.

14.5.5 Additional Road Traffic

The assessment has shown that no mitigation will be required in respect of additional road traffic on public roads.

14.5.6 Inward Noise Impacts

The assessment indicates that there may be some potential noiseimpactfrom rail operations. In order to reduce the level of rail noise within dwellings proposed along the southern boundary of the site, the following mitigation measures are proposed:

- The boundary wall running along the west of the site will be increased to 3.0metres height relative to the finished floor level of the nearest houses and apartments, and;
- Upgraded glazing and ventilation will be incorporated into the design for facades of dwellings incident to the rail line. Glazing offering sound insulation performance of at least 33dB R_w shall be fitted. Additionally through wall or in frame vents shall be selected to offer a sound insulation performance of 35dB $D_{n,e,w}$.

It is envisaged that once these measures are implemented that the level of rail noise incident to dwellings can be reduced to within the design goals outlined in Section 9.3.1.

14.6 Landscape and Visual Impact

Impact mitigation measures include designing the development into the landscape in a sympathetic way by utilising the existing landscape palette of the area, through native planting, and maintaining the existing hedgerows where possible. Extensive new landscaping will be carried out to protect and enhance the character of the site and the area

The proposed landscaping is based on the following criteria:

- In-depth look at the site, its location, orientation, aspect and environment.
- Topography
- Existing vegetation on site.
- Local tree and plant forms within the wider landscape.
- Hard landscape features.

To this end a full list of attributes has been obtained through visits to site and the local area surrounds. Plant selection is based on existing native trees and shrubs located in the area. all existing mature trees are retained where possible and clear recommendations to deal with the preservation of existing trees are included in the landscaping proposals.

The proposed landscaping works were carried out in consultation with the project ecologist to achieve Flora and Fauna enhancement and preservation. The proposed Residential units will merge into the local landscape and the existing character of the area will be maintained, enhanced and protected.

14.7 Traffic Impact

- No Mitigation required.

14.8 Cultural Heratige – Archaeology

- Any future development of Area 1 should be subject to archaeological monitoring under licence by a suitably qualified archaeologist.
- All boundary treatment/habitat protection measures in the foreshore area should be subject to archaeological monitoring. [1] during construction.

[1]All recommendations are made subject to the approval of the Department of Arts, Heritage & Gaeltacht.