PREAMBLE

Introduction

This preamble sets out the scoping and screening process involved in the preparation of this Environmental Impact Statement (EIS). In addition, this preamble outlines the pre-planning discussions which were undertaken for this development, the contributors to the document and also the technical difficulties and lack of data that occurred in the preparation of this document. Finally, this section outlines the contents of the following chapters.

Screening / Scoping of Environmental Impact Statement

This Environmental Impact Statement (EIS) has been prepared by Cunnane Stratton Reynolds in association with Michael Punch and Partners, Newenham Mulligan Architects and Murray O Laoire Architects on behalf of Limerick Race Company PLC. The scope and range of issues to be considered within this EIS follows consultations between the Planning Authority, the applicant and their team of consultants.

Environmental Impact Assessment (EIA) is provided for in Part X of the Planning and Development Act 2000 (The Act 2000) and in the Planning and Development Regulations 2001 (the 2001 Regulations) for specified classes of development prescribed by regulations made under section 176 of the Act 2000. The prescribed classes of development are set out in Schedule 5 of the 2001 Regulations. Article 10(b) Part 2, Schedule 5 10(iv) sets out that an EIS is required for urban development which would involve an area greater than two hectares in the case of a business district.

This Environmental Impact Statement has been carried out in accordance with Schedule 6 of the Planning and Development Regulations 2001. The Non-Technical Summary consists of a synopsis of the specialist technical reports and a commentary upon significant direct and indirect effects upon the environment.

This EIS describes the significant effects on the environment arising from the proposal to develop a mixed use scheme at the former Greenpark Racecourse, Dock Road, Limerick.

This development will be implemented on a phased basis and this EIS examines the issues in relation to the entire development as per the Masterplan. The prepared Masterplan facilitates the phasing of the development over time. This EIS will be submitted with the initial two planning applications that will constitute phase one; namely the retail element, the first element of the residential development and the landscaping and amenity area.

The Local Authority advised that a comprehensive, quality and integrated approach should be adopted in relation to the development of this site. The scope of this EIS is to create a sustainable development and make a positive contribution to the urban fabric of Limerick City and Environs.

This EIS is consistent with national planning advice; both existing and emerging, local initiatives such as the Limerick City Development Plan 2004.

Pre-planning Discussions

Several pre-planning discussions were undertaken in conjunction with the Planning Department of Limerick City Council, other departments consulted include housing, roads and sanitary services.

Revisions

The original EIS submitted with the planning application was lodged in December 2004. This EIS has been revised in order to reflect questions raised in the Council's subsequent correspondence so that a more complete set of documentation is available to the Council and public. The revisions have included alterations to reflect the withdrawal of an adjacent planning application in relation to the provision of a retail development, additional detail in relation to soil levels to clarify the engineering drawings and documentation submitted and additional traffic documentation submitted in response to the Council's requests for Further Information and Clarification of Further Information.

Contributors to the Environmental Impact Statement

The Contributors to the Environmental Impact Statement are as follows:

Co-ordination of EIS, Retail Impact Assessment, Landscape and Visibility Assessment, Town Planning and Socio- Economic (Population, Employment and Community) Issues:

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Structure of the Statement

Schedule 6 of the 2001 Regulations defines the level of information to be contained in an EIS. This EIS has been prepared in accordance with these requirements and has been structured in the following manner.

Preamble
Non Technical Summary
Chapter 1: details of Proposed Development; and planning context of the development
Chapter 2: details on the main alternatives to proposed development;
Chapter 3: details on specified information and forecasting methods;
Chapters 4 to 13: assesses the likely environmental effects of the development; and
Chapter 14: interactions of the effects on the environment.

CHAPTER ONE: THE DEVELOPMENT & PLANNING CONTEXT

1.1 Introduction

This chapter outlines the proposed development in terms of its location, current land use and the description of the proposed development. In addition, the various relevant planning issues and planning policies at a national, regional and local scale are addressed.

1.2 Proposed Development

1.2.1 Site Location / Current Use

The proposal consists of the development of the former Greenpark racecourse in the townland of Ballinacurra (Hart), located in the environs of Limerick City. The study area comprises a 48 hectare (approx.) parcel of land which is located between the Dock Road and the South Circular Road to the south west of the city and the site boundary is illustrated in Figure 1.1.

1.2.2 Surrounding Uses

The site is bordered to the east by a number of established and newly constructed residential estates, to the north-west by the N69 Dock road, to the north-east by a number of residences and the Dock Road Industrial Estate, while the Ballynaclogh River runs close to the southern perimeter of the subject lands. The lands to the west and northwest of the site are classified as developed industrial/commercial lands, while those located to the north and east of the site are of a residential nature. To the south of the site, the lands are undeveloped.

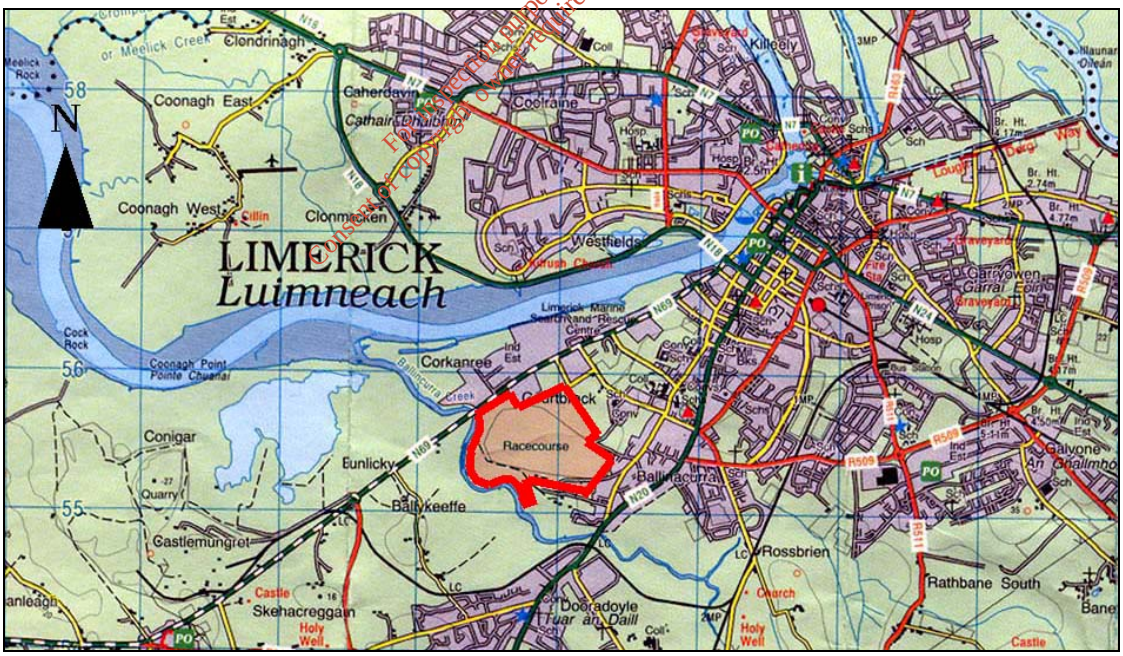


Figure 1.1 Location of Site

1.2.3 Proposal

The overall site, given its importance, scale and nature requires a strategic and plan led approach which demonstrates a comprehensive and long term solution to all the potential issues. This has been achieved by the preparation of a Masterplan which gives guidance and direction to all future decision making on the site, thus realising its full potential to create a sustainable development and make a positive contribution to the urban fabric of Limerick City and simultaneously ensure that a quality approach to design is adhered to throughout the site. This concept was discussed with the Local Authority and the detailed Masterplan of the entire site is contained within this EIS.

This EIS assesses the impacts of the first two phases of development which in broad terms are the retail[1], residential and recreational/amenity components. The subject applications complement the overall Masterplan in terms of design, layout and land use.

The purpose of the Masterplan is to realise the optimum development potential of the site in a sustainable manner through the provision of a mix of land uses which are complementary to the objectives of the Development Plan. The Masterplan will maximise the long term development potential of the land without compromising short to medium term objectives. The Masterplan places an emphasis on a quality approach to the design and layout of infrastructure, buildings and landscape and ensure the sensitive integration of the development with the adjoining Ballynaclough River amenity area, incorporating quality public amenities.

Two separate planning applications constitute the first two phases of this development; separating the retail elements (now withdrawn) from the residential elements, however both applications include the recreational amenity area. The inclusion of the amenity areas in both applications is in response to a request by Limerick City Council to incorporate the amenity elements of the overall Masterplan in both applications. For clarity, the components of the entire Masterplan are broken into three areas and each is described in detail below. The Masterplan is included overleaf.

Area A – Retail / Commercial Area

The proposed retail development consists of the development of a supermarket with a gross floor area of 4,800sq.m. and two anchor comparison units of 7,000sq.m. each, a further 39no. additional units are also proposed ranging in size from 79sq.m. to 1,295sq.m. amounting to a total of 12,081sq.m. gross floor area for these units. In total there is 30,881sq.m. gross floor area of retail floor space proposed. In addition there is a foodcourt of 3,496sq.m. proposed comprising 8no. individual units ranging in size from 96sq.m. to 275sq.m. The application for the retail component includes 1,862 car parking spaces at basement and surface level; 1691 spaces for customers and 171 spaces for staff.

While the retail element of the Masterplan was proposed under an application that is now withdrawn, it is considered appropriate that this volume of development is still recognised in this EIS so that a more complete set of documentation is available to the Council and public. This is particularly illustrated in the traffic element of the EIS so that the Council and public can be apprised of the future potential environmental impacts and mitigation.

Area B – Residential Area

In total the lands are capable of providing c. 900 residential units, however the first phase of development provides for 353 units. The residential unit type breakdown is as follows; 70 no. detached houses, 54 no. semi-detached houses, 43 no. terraced houses, 29 no. duplex units, 28 no. apartments below duplex and 112 no. apartments. In addition as part of phase 1, it is proposed to provide a neighbourhood centre which will include; a retail unit (265sqm gross), café (130sqm gross), doctor / dentist office (140sqm gross) and a crèche facility (540sqm gross). A number of playgrounds are also provided for in this phase.

[1] An application for this element of the development having been withdrawn

The application includes parking for approximately 725 car spaces (including basement carparking) for the residential and neighbourhood centre elements to this scheme. Table 1.2 overleaf shows breakdown of the units.

Table 1.2 Residential Unit Breakdown

Schedule of units sizes - Residential Area					
Unit Type	**Approx Unit Area**	**No. of Floors**	**No. of Beds**	**No. of Units**	**Sub Total No. of Units**
Residential Units					
Detached House - Type A	164sqm	2	4	31	
Detached House - Type B	181sqm	2	4	17	
Detached House - Type C	181sqm	2	4	22	70
Semi - Detached - Type A & B	130sqm/130sqm	2	3	54	54
Terraced House	129sqm/142sqm	2	3		43
Duplex Units	120sqm	3	3		29
Apartments below Duplex	75sqm	2	2	26	
Apartments below Duplex	75sqm	2	1	2	28
Maisonette Apartments	100sqm	4	2	11	
Maisonette Apartments	100sqm	4	3	6	17
Apartments	75sqm	4	2	100	
Apartments	75sqm	4	1	12	112
Total No. Residential Units					**353**

Retail / Neighbourhood Centre	
Crèche	540sqm
Café	130sqm
Doctors / Dentist Office	140sqm
Retail	265sqm

Area C – Amenity

The amenity and recreation lands at Greenpark include a range of passive and active recreation opportunities with approximately 100 ancillary car parking spaces. The formal recreation facilities at Greenpark include four tennis courts, one full size soccer pitch and ten five a side pitches and ancillary changing facilities. A children's playground is also provided. Passive recreation features include open grassed spaces for informal recreation, woodland and riverside walks and viewing/lookout points. The main spatial features of the site are avenue tree planting, woodland planting, feature mounding and the attenuation lagoon. Formal avenue tree planting frames main access routes and provides a clear structure defining different areas of use within the amenity lands. The attenuation lagoon is a focal point on the site. It draws the wetland environment into Greenpark providing opportunities for a more intimate relationship with the water. Some of the spoil from the excavation of the attenuation areas is used to create earth mounds and rolling topography on the site enclosing and sheltering the lagoon.

The landscaped amenity area will be developed on a phased basis; to be provided in conjunction with the provision of the phases of residential and future retail development. From the outset, the entire of the amenity area will be grassed and a number of the pitches and carparking will be provided with the first phase of housing.

An estimated 700 persons will be employed in the construction of this development and a further 400 will be employed in the completed scheme when operational.

The layout for the masterplan is included overleaf.

Insert masterplan

1.2.4 Scale of Development / Design Description

Masterplan

The NMA retail masterplan strategy was developed in conjunction with MOLA housing masterplan responded to the planning requirement to look at this important site in its totality and develop the pedestrian linkages to the leisure amenity parkland space. The leisure amenity open space prepared by CSR creates a buffer zone between the public retail use and the private/semi – public housing uses.

The Residential design description is included below.

Residential (Murray O Laoire Architects)

The concept of the Greenpark Housing Development is informed by the notion of creating a place, which refers to its immediate and historical context. We aim to achieve this by making the ordering principle of the layout the alignment of the previous racecourse track at Greenpark Racecourse. We are suggesting a new 'Racecourse Avenue', which forms the main access to the various housing clusters and specific functions of public open space, following the alignment of the previous racecourse. Having laid this foundation, which forms the main access, we carefully considered routes to the various areas of land providing further access for pedestrians, cyclists and vehicles. It was always clear in the development of access routes through the site that vehicle access may only be achieved from the Dock Road. In order to ascertain cyclist and pedestrian permeability through the site, we suggest a variety of north south and east west routes and access points, anchoring the site and the proposed development within its context. These consider the South Circular Road Access from Log na Capall Phase 1 & 2 and Greenpark Avenue, access from the McInerney Development to the northeast, access from Courtbrack Avenue and adjacent McInerney Developments to the far north and the Dock Road. The layout also suggests future potential access points to Vances' lands to the south.

The housing layout:

Contextually it is clear that the highest density of development should happen along the northern edge and in the centre of the site. We have also suggested a zone of high-density development along the western boundary of the housing development in order to create a sense of urban enclosure along this new link road. This higher density development will consist of a mix of duplex apartments, maisonette apartments and standard on level apartments with basement carparking. We have made a clear decision to create basement carparking in order to create the opportunity for the high quality of public open space. The underground parking areas have direct access to the apartments above.

It is within this central high density development area that we have created the larger areas of public open space. These follow the line of the new 'Racecourse Avenue' and are formed by perimeter buildings in regular rectangular shapes of public open space, yet achieving a variety of specific functions to each area of public open space. This variety of public open space 'squares' face outwards towards the public realm of the 'Racecourse Avenue', which is defined by a pedestrian footpath and a bicycle path. In the development of these apartments and duplex apartments we have been conscious of offering the community the option of shared open space areas or private open space areas and we have therefore suggested some blocks which have their own private back garden spaces and others which do not. We have also been conscious of maximising direct sunlight into these units and we have configured and changed the layouts according to its orientation on the site accordingly.

In this high density area of development is the village centre. We have marked the village centre with a five storey high apartment tower and suggest functions such as a crèche, a variety of small retail outlets, doctors surgery and dentist and a public square to be served by a coffee shop. This village centre is in the very centre of the high-density development area and has strategically been located at the turn of the proposed 'Racecourse Avenue'. Setback from the street and the proposed apartment buildings has been allowed, in order to ensure privacy, continuity and flow between the various areas of public open space. In designing for privacy the placement and allocation of rooms within the various buildings have been

considered. Apart from the 5 storey tower signalling the village centre we have also created 5 storey towers in order articulate a prominent entrance to the housing development, clearly showing the access from the link road to the high density and lower density development areas to the south.

The lower density development area is marked by an alignment of terraced houses along the southern edge of the racecourse avenue. Directly behind the terraces we suggest a street of semi-detached houses and further to the south, the lower density detached house development in cul-de-sac clusters. Each cluster of house type will contain specific areas of public open space, which are linked by pedestrian routes. In this low-density we retained the old parade ring of Greenpark Racecourse as a historical reference and public open space feature. We have been conscious of the treatment of corners and the design of corner houses. These form gateways and celebrate corners and junctions in order to encourage a communication between the building, its occupants and the streetscape, thus suggesting a sense of community. We have attempted to reduce the scale and massing of the various buildings by various design devices in order to achieve a human scale and comfortable living environment.

We have also suggested a variety of different house types ranging from detached, semi-detached and terraced houses and have designed 3 or 4 different types of houses within each of these categories. The design of the pedestrian routes in the lower density area create events within approximately 5 minutes walking distance of each other by specific design consideration in junction treatment and unit layout. The aim is to create an eventful movement route by good place making which will provide what we hope to be a successful connection to existing and surrounding places. We have provided as much choice as possible for pedestrians and cyclists to find their end destination and have suggested a variety of paving and ramped surfaces at junctions (such as junctions tables) in order to control the movement and speed of vehicles through these areas.

We have suggested a reasonably limited hardwearing palette of material choices such as rendered walls, zinc roof and zinc cladding, copper roof and copper cladding, stone wall surfaces, face brick wall surfaces, slate roofs to the lower density houses, timber windows and doors and timber screening around the duplex units staircases. In some of the larger buildings we have attempted to juxtapose the vast horizontal expression by a series of vertical openings. We have been conscious of way the buildings meet the ground by expressing the ground floor treatment on the external façade in a different material than the façade and of plane of façade to the central floors and by clearly expressing the way the building meets the sky by introducing a slight parapet and a different material to the upper floor. We have also been aware of the corner treatment of the buildings by showing a step in the façade and, in most cases, an increase in height at the corners of buildings. Whilst the architecture of the apartment and duplex blocks and similarly the retail areas communicates a contemporary style, we have been slightly more conservative in the approach to the design of the lower density units such as detached, semi detached and terraced houses. We have done this in line with the contextual precedent of this area.

Landscape / Amenity (Cunnane Stratton Reynolds)

The main objective of the landscape design is to provide a cohesive and ordered landscape framework in which future development will rest. The landscape will have the overall effect of integrating new built development visually and spatially into the existing open landscape by imposing a new framework of vegetation. A range of landscape spaces and characters will provide an environment that is legible and caters for a broad spectrum of use and experience. The site is adjacent to the Ballynaclogh River, a rich ecological feature designated as an SAC (Special Area of Conservation). The landscape masterplan aims to build on the ecological value of the Ballynaclogh River by extending native and naturalised planting regimes into the Greenpark site.

The amenity and recreation lands at Greenpark include a range of passive and active recreation opportunities. The formal recreation facilities include four tennis courts, one full size

soccer pitch and ten five a side pitches. Passive recreation features include open grassy spaces for informal recreation, woodland and riverside walks and viewing/lookout points.

The main spatial features of the site are avenue tree planting, woodland planting, feature mounding and the attenuation lagoon. Formal avenue tree planting frames main access routes and provides a clear structure defining different areas of use within the amenity lands. The attenuation lagoon is a focal point on the site. It draws the wetland environment into Greenpark providing opportunities for a more intimate relationship with the water. Some of the spoil from the excavation of the attenuation areas is used to create earth mounds and rolling topography on the site enclosing and sheltering the lagoon.

The south bank of the lagoon in the amenity area abuts the SAC (Special Area of Conservation) / Ballynaclogh River. It is proposed that this area be natural in character with supplemental planting of approved native species enhancing the ecological value. The planting associated with the attenuation lagoon will also maintain and seek to enhance the ecological diversity on the site. The landscape design has been carefully developed in tandem with an ecologist's advice to ensure that native flora and fauna are not adversely affected by the proposed development but actually prosper from it. Woodland planting divides the amenity area into smaller more manageable portions whilst acting as windbreaks and acoustic buffers from highway traffic. Woodland will not only create useful micro-climates for sporting and passive recreation activities, but also add visual interest and create additional habitat.

1.2.5 Zoning

The site is zoned for **General Purpose** and **Open Space**, in the Limerick City Development Plan 2004. The uses that are permitted in principle and open for consideration in these zones are outlined below and the subject uses are highlighted.

The uses permitted in principle in the General Purpose Zone are: Bed & Breakfast/Guest House; Betting Office; Bring Banks; Casual Trading; ***Carpark***; Civic Amenity Sites; Community Facility; ***Crèche/***Nursery School; Cultural Use; ***Doctor/Dentist*** etc; Education; Enterprise Centre; Funeral Home; Garden Centre; Halting Sites; Health Centre; Home Based Economic Activities; Hotel/Motel; Industry-Light; *Offices less than 100m2; *Offices 100m2 to 1,000m; ***Open Space*****;** Petrol Station; Public House; Public Services; Recreational Buildings (Commercial); Recreational Facility/Sports Club; ***Residential*****;** Residential Institution; ***Restaurant***; Retirement Home; Schools; Science & Technology/Based Industry; Service Garage; *Shop-Local; Shop-Neighbourhood*; Stadia; Veterinary Surgery

The Uses open for consideration in the General Purpose zone are: Advertisements and Advertising Structures; Boarding Kennels; Cash & Carry/Whole Sale Outlet; Cemetery; Church; Dancehall/Discotheque; Heavy Vehicle Park; Hospital; Household Fuel Depot; Industry-General Industry-Special; Motor Sales Outlet; Refuse Transfer Station; Retail Warehouse; Scrap Yard; Shops Major Sales Outlet; Stables; Take-away; Transport Depot; Warehousing

The uses permitted in principle in the Open Space zone are; Bring Banks; Casual Trading; ***Open Space*****;** Stadia

The uses open for consideration in the Open Space zone are: Caravan Park-Holiday; ***Carpark*****;** Cemetery; Church; Community Facilities; Crèche/Nursery School; Cultural Use; Education; Health Centre; Public House; Public Services; ***Recreational Facility/Sports Club*****;** Schools; Stables; Veterinary Surgery

The mix of uses proposed within the development is compatible with the zoning objectives applicable to the site.

1.2.6 Planning History

There have been two previous planning applications on the site. Planning permission was granted in April 04 for a new roundabout onto the N69 / Dock Road from Greenpark and permission was granted on the 8th July 2002 by An Bord Pleanála for infrastructural works which established the blueprint for the subsequent Masterplan. The planning history of the site and the immediate surrounding areas is outlined on Table 1.2 overleaf. This table excludes domestic applications.

Table 1.2 Planning History

Greenpark Planning History (2000- to date) (excludes small Domestic Applications)				
Ref. No.	**Address**	**Applicant**	**Description of Development**	**Decision**
On Site				
03/343	Dock Road	Limerick Race Company	Permission for a new roundabout on the N69 (Dock Road). The roundabout and access road have been previously granted permission (Ref 01/130) and the infrastructure confirmed by An Bord Pleanála Pl 30.130232	Final Grant 6th April 2004
P01/130	Greenpark Racecourse	Limerick Race Company	For the development of lands for infrastructure to include a new roundabout on the N69 (Dock Road), roads, sewers, watermains, other underground services and landscaping (construction of roads and services for the future development of lands).	Final Grant, An Bord Pleanála 8th July 2002
Adjacent Sites				
P00/27	Castlewell, Courtbrack Avenue	McInerney Construction Ltd	Construction of 56 dwelling houses at Castlewell and the construction of foul and storm water sewers from Fitzhaven via Westbourne Convent lands to Daly's lands at Courtbrack Avenue Lower and Dock Road to pick up all existing services.	Final grant 31st July 2000
00/398	Dock Road, Corcanree	Roches Feeds Ltd	Extension to existing facilities which will include a warehouse and process mill extension with associated works	Final Grant 27th January 2004
03/413	Greenpark, South Circular Road	MA Ryan & Sons	To construct 16 semi-detached houses, 23 ground floor apartments, 23 maisonettes and ancillary works	Final Grant, An Bord Pleanála 9/9/2004
01/51	Courtbrack Avenue	McInerney Construction Ltd	To construct a student housing development consisting of 44 apartments, seminar room, ancillary offices, furniture store, ancillary road, parking, bin storage and landscaping	Final Grant 19th August 02
01/53	Alandale, Daly's lands, Courtbrack Ave & Dock Road	McInerney Construction Ltd	Seeks approval for the design and details of a temporary lagoon as requested under condition no. 21 planning ref. no P00/27	Final Grant An Bord Pleanála 26th April 2001
01/136	Unit A1, Corcanree Industrial Estate, Dock Road, Limerick	P Ryan	Carry out alterations to front and side elevations, provide new side door and demolish stores area in rear yard	Final Grant 18th July 2001
03/352	Unit A1, Corcanree Industrial Estate, Dock Road, Limerick	M O' Dwyer	Retention of signage to the front facade of the existing single-storey industrial unit and retention of change of use to car showroom and ancillary uses of the front and part of the rear section of the existing building	Final Grant 15th March 2003
01/25	Dock Road	TDI Ltd	Retain one advertising structure	Final Grant 5th June 2001
00/241	Alandale, Courtbrack Ave & Dock Road	McInerney Construction Ltd	4 residential units	Final Grant 2nd October 2000

1.3 Planning Policy Context – National and Regional Context

1.3.1 Sustainable Development: A Strategy for Ireland (1997)

The document '*Sustainable Development: a Strategy for Ireland*' prepared by the Department of Environment and Local Government provides a comprehensive analysis and guidance which will allow sustainable development to be taken forward in Ireland. Sustainable development as espoused in this EIS is defined as an acceptable quality of life for present and future generations recognising that the actions of the present affect the inheritance of future generations. In a sustainable world, human activity must not undermine the long term productivity of supporting eco-systems. The concept of sustainability requires that development must be within the capacity of the environment to support it without creating lasting damage or depletion.

The Government considers sustainable development as:

- A dynamic concept which must be given both practical and concrete expression in the present to generate a new development model for the future involving change in socio-economic and consumer behaviours.
- An inclusive concept bringing environment to the heart of economic growth and quality of life concerns, and requiring the active participation of economic operators and the public.
- A quality concept which recognises that a clean environment and a conscientious approach by business to environmental protection are an advantage to rather than a constraint on, successful economic performance.

1.3.2 National Development Plan 2000-2006

The National Development Plan adopted four national objectives;

- Continuing sustainable national economic and employment growth
- Consolidating and improving Ireland's international competitiveness
- Fostering balanced regional development
- Promoting social inclusion

The objective of balanced Regional Development will be implemented in the Plan through;

- Infrastructural investment in the Operational Programmes especially Roads, Public Transport and Environmental Services investment;

- The promotion over the period of the Plan of a small number of additional regional Gateways (urban growth centres) to complement the existing Gateways and to drive development throughout both Regions.

In respect of the South & East Region (which includes Limerick City) the National Development Plan's objectives are to;

- Consolidate and build on the Region's recent economic performance, especially regarding employment and reductions in long-term unemployment thereby maintaining the Region's key role in national economic competitiveness;

- Address urban congestion and general bottlenecks to growth in Dublin and other urban centres particularly as regards economic and social infrastructure and human resources;

- Further develop counter-balances to Dublin, relieving pressure on the capital and its hinterland, and distributing growth more widely throughout the Country;

- Support the further development of agriculture, agribusiness and the seafood sector;

- Promote social inclusion in deprived urban and rural areas; and
- Maintain a viable rural economy.

1.3.3 National Spatial Strategy 2002-2020

The National Spatial Strategy is a twenty year planning framework designed to achieve a balance of social, economic, physical development and population growth between regions. The Strategy promotes principles which helps renew, consolidate and develop existing cities keeping them compact, minimising urban sprawl and using urban land '*carefully, sensitively and efficiently with the aim of reducing dereliction and under utilisation'*. Limerick – Shannon is designated as a '*gateway*' in the National Spatial Strategy. Gateways are centres with a strategic location, nationally and relative to their surrounding areas, providing national-scale social and economic infrastructure and support services. This will result in substantial inward investment and population growth over the next twenty years. This development will secure the implementation of the objectives of the National Spatial Strategy and contribute to the objectives of balanced regional development. The population of Limerick and catchment area (which includes Ennis) is currently 236,000, the National Spatial Strategy predicts two possible population growth scenarios, the first in accordance with current trends is a growth to 260,000 by 2020 and the second predicted population is with economic growth is 284,000 by 2020.

1.3.4 Mid West Region –Regional Strategy and Regional Planning Guidelines 2004

The Strategy (adopted May 2004) outlines that the hub of the Mid-West Region is the Limerick/Shannon/Ennis Axis, the axis being at the convergence of a number of rail, road and air transport corridors.

The development strategy highlights a number of key location issues;

- Mobilising Limerick, Ennis and Shannon as an engine of growth in the international economy
- Facilitating other key towns to act as development hubs in their area
- Promoting rural development with policies customised to the requirements of different areas.

The Guidelines predict that the population of the Mid West Region will grow from 340,000 in 2002 to almost 380,000 by 2020.

The chosen option for the development of the region includes the co-ordinated development of Limerick/Ennis/Shannon as a single integrated metropolitan centre that acts as a core driver of the region and a principal mechanism for attractive investment into the area. There would be an integrated public transport system, as well as a system of roads.

The potential of the Limerick/Ennis/Shannon zone is outlined as;

- Development as a key element of the western/southern economic corridor
- Attraction of foreign direct investment
- Location of major research and development functions
- **Centre for regional scale social and commercial facilities**
- Location of enterprise-based strategic development zone
- Major inter-regional access hub and modal interchange
- Principal tourist access point and service centre
- Base for larger indigenous industry
- Location for national centres for specialised activity
- Location for major transportation, bulk-breaking and distribution centres to service areas to the North and South

1.3.5 Limerick Planning, Land Use and Transportation Study (PLUTS)

This document promotes sustainable development through a regional strategy for the planning, land use development and transport systems in the Greater Limerick Area, which includes all of Limerick City and parts of Limerick County, Clare and North Tipperary.

According to the Limerick City Development Plan 2004, some key objectives of the PLUTS plan include the enhancement of Limerick City Centre as the principal regional centre for the West of Ireland for retail, business and leisure and to reinforce the economic strength of the PLUTS area by building critical mass of population and jobs within defined corridors to act as a counterbalance to the Dublin region.

This study has not been finalised to date.

1.4 Planning Policy Context – Local Context

1.4.1 Limerick County Development Board Strategy – Working Together for a Better Future

Limerick County Development Board's Vision is that '*Limerick County will be an attractive place for people to live and work with access to quality services where the collaborative focus of communities and service providers can facilitate a good quality of life*.'

The goal for the 'area of urban influence' surrounding Limerick City is 'to provide and facilitate access to the services and facilities associated with contemporary urban area.'

1.4.2 Limerick City Development Board Strategy

The primary goal of the Limerick City Development Board is to 'enhance the lives of all sections of the community through the promotion of balanced and sustainable economic social and cultural development.'

1.4.3 Limerick City Development Plan 2004

The Amended Draft City Development Plan was on display in November 2004 and was adopted on the 20th November 2004. The Plan came into effect on 20th December 04. The overall goals of the Plan include;

- Promotion of the commercial and economic development of the city centre
- Assistance towards the general economic development of the functional hinterland of the city, in co-operation with other concerned and interested bodies.
- Assistance to communities in the provision of community facilities.

The Plan outlines that in order to sustain the proposed population growth of 'Greater Limerick' that there will be a requirement to provide between 8,000 and 13,000 new jobs to sustain this population increase. (p.48)

One of the primary goals of the Plan is to promote Limerick as the hub and primary urban centre of the Mid West Region and to ensure that the city maintains its pre-eminence status as 'Gateway City' in terms of the National Spatial Strategy. The Plan seeks to promote Limerick as an employment location and to promote the retail sector of the city.

The Mid West Retail Strategy identifies potential future expenditure capacity in the region for the next 6/7 years although it does not spatially allocate this floorspace throughout the region. To date the majority of retail proposals subsequent to the publication of the Strategy have been located within the jurisdiction of the County Council. Greenpark represents a major opportunity for the City Council to capitalise on available expenditure on the last significant available site within its jurisdiction in close proximity to the City core. The development at Greenpark is likely to occur on a phased basis over a ten year timescale; consequently the expenditure available to justify this proposal will extend well beyond the lifespan of the Mid West Strategy.

This development will help achieve a number of key Local Authority objectives; it would promote growth in a sustainable manner by concentrating development in a site adjacent to the urban core which will maximise use of the existing infrastructure; the site will facilitate the promotion of commercial uses for which there is a clear demand for in Limerick City; it would improve the range of services within the city and encourage greater linkages between residents and the local economy; commercial/recreational uses would further reinforce the tourist profile of the city and the provision of active leisure facilities would improve the socio-economic profile of the City in particular for the indigenous population addressing the identified deficiencies in this sector; the proposal will create additional jobs representing a significant boost to the local economy and complement existing facilities in the area and wider environs.

By virtue of the zoning applicable to the site, the Council acknowledge the Strategic nature of the lands at the former Green Park Racecourse and the opportunities that exist to promote a mix of uses on this site. It is the objective of the City Council to encourage the optimum development of the site in a sustainable manner through the provision of a mix of land uses which are complementary to the other objectives of the Development Plan.

Amenity Objectives

Policy RA 4 There is a recognised need for additional children's play areas in the city.

This development recognises this through the provision of a number of playgrounds in the residential and amenity elements of the scheme and a second playground in the amenity area.

Policy RA 6 It is the view of the City Council that where practical, open space for the whole Borough area, inclusive of passive and active open space, be provided at ideally at the rate of 4 Ha's (10 acres) per 1000 population, and that a standard of 2.8 (7 acres) per 1000 population be regarded as a minimum acceptable requirement.

Area 2 of the residential scheme contains 353 residential units, when the Limerick City average household number (2.71 persons per unit) is applied (from Census 2002) will result in approximately 957 persons. In this area 3 acres of public open space is provided including the playgrounds. However, the leisure and amenity area also applied for in this scheme provides approx. 47 acres (19 ha) of open space amenities, which ensures the development complements City Development Plan objectives.

Policy RA 8 Promoting Bio Diversity: It is the policy of the City Council to ensure the promotion of bio-diversity for the conservation of the natural heritage, through the protection of existing sustainable habitats, and the upgrading or improvement of existing or new habitats by the introduction of native species of local flora and fauna.

This point is discussed in greater detail in Chapter 8 Flora and Fauna. The planning applications include landscape plans which include the protection of the existing habitats to the south of the site and also the creation of new habitats.

Policy RA 11 Protection of Riverine Corridors: It is the policy of Limerick City Council to:

- *Recognise and promote the protection and conservation of the City's water ways as natural assets of the urban environment*
- *Protect and manage the riverine corridors, defined as those areas linked physically or visually to a river, in order to minimise conflict between conservation and development*

The area adjacent to the Ballynaclough River is within the amenity areas and steps have been taken to protect this area.

Policy RA 12 Special Protection Areas: It is the policy of the City Council to maintain and to continue to designate all National Heritage (NHA), Special Protection (SPA) and Special Conservation (SCA) areas … in terms of the relevant legislation and directives relating thereto.

Policy RA 15 Tree Planting: It is the policy of Limerick City to create a series of green wedges throughout the City to link open spaces, roadside verges and city streets.

There is a substantial amount of tree planting incorporated in the amenity area of this development.

1.4.4 Limerick City Housing Strategy

In the City Development Plan 2004, some of the Housing Strategy goals are outlined as:

- To develop and deliver effective planning policy
- To increase the availability of affordable, social and private housing and to ensure the adequate provision of residential zoned land for all
- To enhance the support network in the provision of social and affordable housing
- To promote integration and reduce social segregation in housing development
- To promote sustainable housing developments and provide appropriate residential development
- To promote high quality living environments and the protection of the character of residential neighbourhoods

The applicant has been in contact with the Limerick City Council's Housing Department to discuss the provision of residential units in accordance with Section 97.

1.4.5 Limerick & Environs Sports and Recreation Policy Framework Plan

This report is in the final stages before adoption by Limerick City Council, it is anticipated that this plan will be adopted in January 2005. It outlines an overall framework for the provision and maintenance of recreation and open space amenities in Limerick City and environs. It outlines the policies that the City Council should adopt with regards to the provision of these.

The Plan makes specific reference to Greenpark and the following points outline the policies in the Framework Plan with regards to the subject site:

- Greenpark should be a District Park with amenity area of 8.1ha
- Greenpark should include a children's play area
- New pitches should be included in any future development of Greenpark
- 'It is anticipated that although currently in private ownership that the development of this site would have sufficient land set aside for public open space for it to function and have the role of citywide or at least district wide open space.'

All of these objectives will be realised in the development of the Greenpark Masterplan.

1.4.6 Limerick Docklands Study

This study is in initial stages of preparation and includes Greenpark within its study area.

1.5 Conclusion

The residential element is designed to ensure maximum integration and permeability within the housing layout and with the neighbouring lands including the future retail elements. The principal aim of this development is to promote a unique residential development which maximises the opportunities presented by the physical environs of the site and its surroundings. The development is consistent with the stated policies of the City Development Plan on housing development and also accords with national guidance such as the Residential Density Guidelines. In particular the proposal provides for a high quality residential development which will be compatible with the nature of surrounding land uses.

The development will seek to satisfy market demand within this area thus ensuring the promotion and consolidation of this area particularly with regard to residential demand and curtailing the pressures of inappropriate development in less sustainable locations.

The development accords with the principles of sustainable development advocated in 'The Residential Density Guidelines' which seek to concentrate development in existing urban areas which have easy accessibility to public transport, and maximise use of existing infrastructure.

The actual mix and layout of units within the site is designed to provide a diverse range of residential units in an innovative design context in an effort to avoid a bland 'suburban' type development.

The provision of c.19Ha of active and passive recreational amenities will provide Limerick City with a major amenity destination unmatched elsewhere in the city.

CHAPTER TWO: ALTERNATIVES EXAMINED

2.1 Introduction

The Environmental Protection Agency's *Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)* outlines that alternatives indicating the main reasons for choosing the proposed development may be described at three levels, namely alternative locations, design and processes.

2.2 Alternative Locations

2.2.1 Location within Limerick City

The site is zoned for development in the current Development Plans which indicates the Planning Authority's intention that the site will be developed in the future.

The site is zoned for **General Purpose** and **Open Space**, in the Limerick City Development Plan 2004. The uses that are permitted in principle and open for consideration in these zones are outlined below and the subject uses are highlighted.

The uses permitted in principle in the General Purpose Zone are: Bed & Breakfast/Guest House; Betting Office; Bring Banks; Casual Trading; ***Carpark***; Civic Amenity Sites; Community Facility; ***Crèche/***Nursery School; Cultural Use; ***Doctor/Dentist*** etc; Education; Enterprise Centre; Funeral Home; Garden Centre; Halting Sites; Health Centre; Home Based Economic Activities; Hotel/Motel; Industry-Light; *Offices less than 100m2; *Offices 100m2 to 1,000m; ***Open Space*****;** Petrol Station; Public House; Public Services; Recreational Buildings (Commercial); Recreational Facility/Sports Club; ***Residential*****;** Residential Institution; ***Restaurant*****;** Retirement Home; Schools; Science & Technology/Based Industry; Service Garage; *Shop-Local; Shop-Neighbourhood;* Stadia; Veterinary Surgery

The Uses open for consideration in the General Purpose zone are: Advertisements and Advertising Structures; Boarding Kennels; Cash & Carry/Whole Sale Outlet; Cemetery; Church; Dancehall/Discotheque; Heavy Vehicle Park; Hospital; Household Fuel Depot; Industry-General Industry-Special; Motor Sales Outlet; Refuse Transfer Station; Retail Warehouse; Scrap Yard; Shops Major Sales Outlet; Stables; Take-away; Transport Depot; Warehousing

The uses permitted in principle in the Open Space zone are; Bring Banks; Casual Trading; ***Open Space*****;** Stadia

The uses open for consideration in the Open Space zone are: Caravan Park-Holiday; ***Carpark*****;** Cemetery; Church; Community Facilities; Crèche/Nursery School; Cultural Use; Education; Health Centre; Public House; Public Services; Recreational Facility/Sports Club; Schools; Stables; Veterinary Surgery

The mix of uses proposed within the development is compatible with the zoning objectives applicable to the site.

2.2.2 Location within the Site

The location of the proposed developments within the site largely followed the outline of the zoning in the Development Plan. In addition, the residential areas were located close to existing residential areas and the amenity areas were located close to the river and designated open areas.

2.2 Alternative Design

In reaching this design a number of alternatives were assessed by the design team. Issues such as internal circulation, shape of buildings, location and orientation of buildings, scale of buildings, floorspace, suitable access to the site and for servicing vehicles were all discussed.

A number of different options were explored for the site. These are illustrated on Figures 2.1 (Scheme A), Figure 2.2 (Scheme B) and Figure 2.3 (Scheme C) overleaf.

2.3 Conclusion

The various options for this development considered in the pre-planning stages have resulted in the current layout and design. The chosen option is the one with a minimal impact on the surroundings yet has an aesthetically quality design and meets the internal circulation and servicing requirements for a development of this nature.

Figure 2.1 Option 1 Greenpark Proposed Retail and Housing Development Scheme December 2003

Figure 2.2 Option 2 Greenpark Proposed Retail and Housing Development Scheme May 2004

Figure 2.3 Option 3 Greenpark Proposed Retail and Housing Development Scheme August 2004

Figure 2.4 Final Option - Greenpark Proposed Retail and Housing Development Scheme December 2004

CHAPTER THREE: SPECIFIED INFORMATION AND FORECASTING METHODS

3.1 Introduction

In general the compilation of the information necessary for the preparation of the Environment Impact Statement did not present significant difficulties. In certain areas however, such as Traffic, certain assumptions and projections are necessary. Where required, new survey work has been undertaken to complement data that was available from official sources. These statements have been prepared in line with current best practice and the best available information.

The specific methodologies for a number of the following chapters are outlined below.

3.2 Flora & Fauna

A qualitative baseline study of the subject site was carried out 26 July 2004. During this site visit a detailed and comprehensive account of the floral and faunal composition encountered during the survey was recorded. This, combined with desktop consultations of the following resources produced the finalised baseline report as presented.

- O.S. maps for Ballinacurra
- Drawing No. 5857-PL1001 Masterplan
- Drawing No. 04264_1_104 Landscape Masterplan
- Site survey Raceiss 4
- Site Survey 5.
- Environmental Impact Statement "Greenpark Infrastructure Development", April 2001.
- National Parks and Wildlife, The Department of the Environment, Heritage and Local Government.

The proposed development site was surveyed using methodology outlined in the Joint Nature Conservancy Council's Phase I Habitat Survey Techniques (JNCC, 1993). The principal habitats present within the site were identified and classified using the Heritage Council's *A Guide to Habitats in Ireland* (Fossitt, 2000). The dominant species were noted and a species list compiled for each habitat represented.

Floral nomenclature follows *An Irish Flora* (Webb, Parnell & Doogue, 1996) for Latin names and the *Census Catalogue of the Flora of Ireland* (Scannell & Synnott, 1987) for common names. Nomenclature for horticultural species follows the Royal Horticultural Society's *Encyclopaedia of Garden Plants* (Brickell, 1998).

Faunal identifications were confirmed using the following sources:

- *The Macmillan Guide to Birds of Britain & Europe, Macmillan 1998,*
- *Collins Bird Guide, HarperCollins 2001*
- *Exploring Irish Mammals, Dúchas The Heritage Service 2001*.

As opposed to floral investigations, the surveying of faunal usage of subject lands cannot be based upon direct sightings alone. The presence of fauna is substantiated through the detection of field signs such as tracks, habitats, markings, feeding signs, and droppings, as well as by direct observation. Likewise, bird species present on site are recorded along with any notable avifauna habitats, droppings, or tracks. The likely species were assessed in relation to the habitats present within the site.

The site has been previously surveyed for an Environmental Impact Statement produced in 2001. While the date of the actual survey is not provided within the EIS it is assumed from the species noted that it was during the spring, which serves to complement the summer survey which was carried out for this report. This survey builds upon and incorporates the findings of the 2001 spring survey.

3.3 Air Quality

The assessment of air quality has been carried out using a phased approach as recommended by the UK DEFRA (formerly the UK DETR)[5,6]. 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 possible key pollutants was carried out and the likely location of air pollution "hot-spots" identified. An examination of recent EPA and Local Authority data in Dublin and Ireland[7-10], has indicated that SO_2, 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[7-10]. Benzene, although previously reported at quite high levels in urban centres[9], has recently been measured at several city centre locations to be well below the EU limit value[7,10].

The current assessment thus focused firstly on identifying the existing baseline levels of NO_2, PM_{10} and benzene in the region of the proposed development, both currently (using available monitoring data) and when the development is opened (through modelling). Thereafter, the impact of the development on air quality at the neighbouring sensitive receptors was determined relative to the existing baseline when the development is opened (2008) and in the design year (2020). The assessment methodology involved air dispersion modelling using the UK DMRB Screening Model[11] (Version 1.02 (Released November 2003)) and following guidance issued by the UK DEFRA[12-14]. The inputs to the air dispersion model consist of information on road layouts, receptor locations, annual average daily traffic movements (e.g. AADT), annual average traffic speeds and background concentrations. Using this input data the model predicts ambient ground level concentrations at the worst-case sensitive receptor using generic meteorological data. This worst-case concentration is then added to the existing background concentration to give the worst-case predicted ambient concentration. This worst-case predicted ambient concentration is then compared with the relevant ambient air quality standard to assess the compliance of the proposed development with these ambient air quality standards. An assessment was carried out for the four pollutants NO_2, PM_{10}, benzene and CO.

3.4 Noise

Environmental Noise Survey

An environmental noise survey was conducted in order to quantify the existing noise environment. The survey was conducted generally in accordance with ISO 1996: *Acoustics – Description and measurement of environmental noise*: 1982. Specific details are set out below.

Forecasting Methods

Prediction calculations for building services plant have been conducted generally in accordance with ISO 9613: *Acoustics – Attenuation of sound outdoors, Part 2: General method of calculation, 1996.*

Traffic noise levels are predicted in accordance with guidance set out in *Calculation of Road Traffic Noise (CRTN)*[2], giving results in the form of $L_{10(18hour)}$ values. These are then be converted to L_{den} and L_{night} values in accordance with the procedures detailed in the Transport Research Laboratory (TRL) study *Converting the UK traffic noise index $L_{A10,18h}$ to EU indices for noise mapping*[3].

2 *Calculation of Road Traffic Noise, Department of Transport Welsh Office, HMSO, 1988*

3 *Converting the UK traffic noise index LA10,18h to EU indices for noise mapping, Abbott & Nelson, TRL Limited, 2002*

3.5 Traffic

Methodology

This Traffic Impact Assessment has been prepared in the context of the recommendations of The Institution of Highways and Transportation (IHT) Guidelines for Traffic Impact Assessment and the Traffic Management Guidelines, jointly issued by the Department of the Environment and Local Government (DoELG), the Department of Transport (DoT) and the Dublin Transportation Office (DTO). A summary of the methodology of this Traffic Impact Assessment includes the following:

- Define forecasting methods;
- Appraisal of existing and proposed development;
- Appraisal of existing road network;
- Appraisal of existing traffic flows;
- Establish future road network and future background traffic flows;
- Appraisal of future background traffic flows;
- Appraisal of parking;
- Establish proposed development trip generation and distribution of traffic flows;
- Identify proposed development site access arrangements;
- Appraisal of predicted traffic flows with the proposed development; and
- Appraisal of construction traffic

Future background traffic flows on the proposed development local road network have been predicted in the context of the NRA Future Traffic Forecasts 2002 – 2040, the Limerick Southern Ring Road Phase 2 Environmental Impact Statement and the SATURN based traffic model prepared for the Southern Ring Road Phase 2 project.

The National Roads Authority's Design Manual for Roads and Bridges (NRA DMRB) Traffic Capacity of Urban Roads has been used to determine the link capacity of the proposed development local road network.

Traffic count data from similar developments nationally and the IHT Trip Rate Information Computer System (TRICS) have been used to determine traffic generation estimates for the proposed development.

The proposed development entrance junction and the existing and proposed local road network junctions have been analysed using the computer software programmes ARCADY, OSCADY and PICADY, as appropriate.

Forecasting Methods

We understand that the Limerick Southern Ring Road Phase 2 Traffic Model is a strategic transport model development, developed by Colin Buchanan and Partners on behalf of MCOS-COWL JV for the project, using the SATURN suite of computer software programmes. The Limerick Southern Ring Road Phase 2 project is currently being undertaken by Limerick County Council in association with Clare County Council and Limerick City Council. We understand that the Southern Ring Road Phase 2 model represents an extension to the original model developed by Colin Buchanan and Partners for the Limerick Planning Land Use and Transportation Study (PLUTS) for Limerick City Council. The Southern Ring Road Phase 2 model provides predicted peak hour traffic flows for the future modelled years 2008 and 2028, with and without the proposed Southern Ring Road Phase 2 in place.

ARCADY (Assessment of Roundabout Capacity and Delay) is a computer programme for calculating estimates of the capacity of roundabout controlled junctions. The geometric details of the junction are supplied to the programme, together with details of traffic flows and turning movements. The programme analyses the junction in relation to the various traffic flows and calculates the capacity of each approach. The programme also calculates the average queue length on each approach and the average delay per vehicle. The average queue length may be displayed in graphical form.

OSCADY (Optimised Signal Capacity and Delay) is a computer programme for calculating signal timings and estimates of the capacity of traffic signals. The geometric details of the junction are supplied to the programme together with details of the traffic flows and turning movements. The programme analyses the junction in relation to the various traffic flows and calculates the optimum cycle time and the green time for each approach so that the delay for all vehicles is a minimum. The programme also calculates the average queue length on each approach and the average delay per vehicle. The average queue length may be displayed in graphical form.

PICADY (Priority Intersection Capacity and Delay) is a computer programme for calculating estimates of the capacity of major/minor road junctions, where the minor road is controlled by a stop or yield sign. The geometric details of the junction are supplied to the programme, together with details of traffic flows and turning movements. The programme analyses the junction in relation to the various traffic flows and calculates the capacity of each approach. The programme also calculates the average queue length on each approach and the average delay per vehicle. The average queue length may be displayed in graphical form.
ARCADY, OSCADY and PICADY are issued by the U.K. company, TRL.

3.6 Archaeology

The following resources and methods of establishing the archaeological status of the area of the proposed development were used:

The proposed site area and the upstanding remains on the site were examined by two qualified archaeologists,

1. Methodologies as set down in Dúchas publications (1999) and the Aegis Quality Manual (2001) were used in the fieldwork for the site. Layout and assessment carried out in accordance with most recent EPA guidelines (2002);
2. The Recorded Monuments and Places constraint maps and lists were consulted (RMP);
3. A wide range of historical and archaeological records relevant to the study area were consulted;
4. The relevant files of the Archaeological Survey of Ireland (SMR) and the National Museum of Ireland were consulted;
5. All available cartographic sources were consulted;
6. Suitable aerial photographs of the site were analysed for potential archaeological sites;
7. The marine coastal survey (1995) was used. This is a series of aerial infrared photos of the coast of Ireland. As the site in question is on a tributary of the River Shannon, Ballinacurra Creek, which exits into the Shannon estuary, this area was partially included in this survey;
8. Measured drawings that are included in this report were supplied by the client's representatives (CSR) and annotated accordingly;
9. Comparisons with other similar sites were undertaken during the study;
10. The Draft Development Plan for Limerick City was consulted (Limerick City Council 2004);
11. The on-line catalogue of Limerick City Museum was consulted;
12. The impact of any proposed development at the site has been assessed and suitable mitigation has been suggested.

CHAPTER FOUR: EFFECT ON THE ENVIRONMENT - HUMAN BEINGS

4.1 Introduction

Human beings are an intrinsic element to be considered as part of the process of this EIS. The EIS should mitigate against any possible adverse impacts on human beings be they environmental impacts such as those on air, water, soils, dust, noise and landscape or social/economic impacts such as employment, material assets, cultural heritage and amenity. Each of these issues and their impacts on human beings are assessed in the succeeding sections with appropriate mitigation measures provided. This chapter will assess the impacts the proposed development will have on; (i) Population, (ii) Employment, and (iii) Community.

4.2 Population

4.2.1 Receiving Environment

The 2002 Census of population states that the population for Limerick City and County is 175,304 persons. The population for Limerick City was 54,023 which represents an increase of 3.8% over the 1996 census figure. The townland of Ballinacurra (Hart), where the site is located is within the Ballinacurra A Urban District in Limerick City.

The population of Ballinacurra A grew by 48.6% from 1996 to 2002 this growth coincides with the development of a number of housing schemes close to the site, specifically on Courtbrack Avenue.

Table 4.1: Population Change at State, Province, County and Local Level, 1986 To 2002

	1986	1991	1996	2002
State	3,540,643	3,525,719	3,626,087	3,917,203
Munster	1,020,57	1,009,533	1,033,903	1,100,614
Limerick (City & County)	164,569	161,956	165,042	175,304
Limerick City	56,279	52,083	52,039	54,023
Ballinacurra A UD	1,145	1,044	1,102	1,638

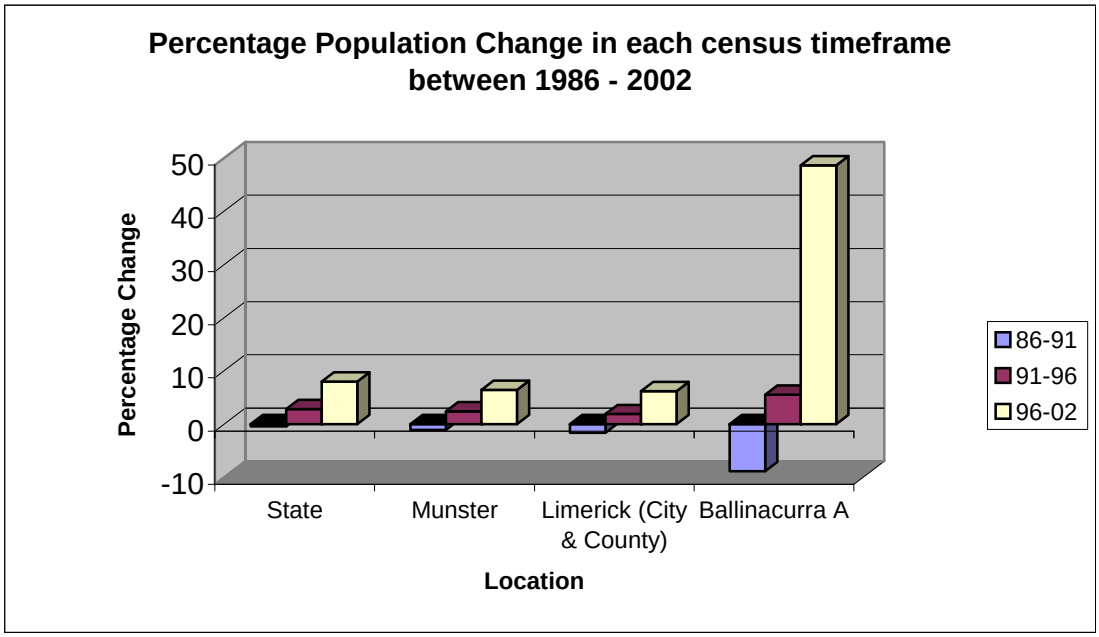
[Source: Census of Population 1986 to 2002]

The National Spatial Strategy predicts that the population of Limerick City and catchment (which includes Ennis) will grow to 260,000 (from 236,000 in 2002). If current trends continue, however and there is continued significant economic growth the NSS predicts the population may grow to 284,000 in the same timeframe.

Limerick City Development Plan 2004 predicts that 'Greater Limerick will experience a population growth of between 21,000 and 29,000.'

The chart below further illustrates the change in each census period of Ballinacurra A UD's population compared to average State, Province and County levels.

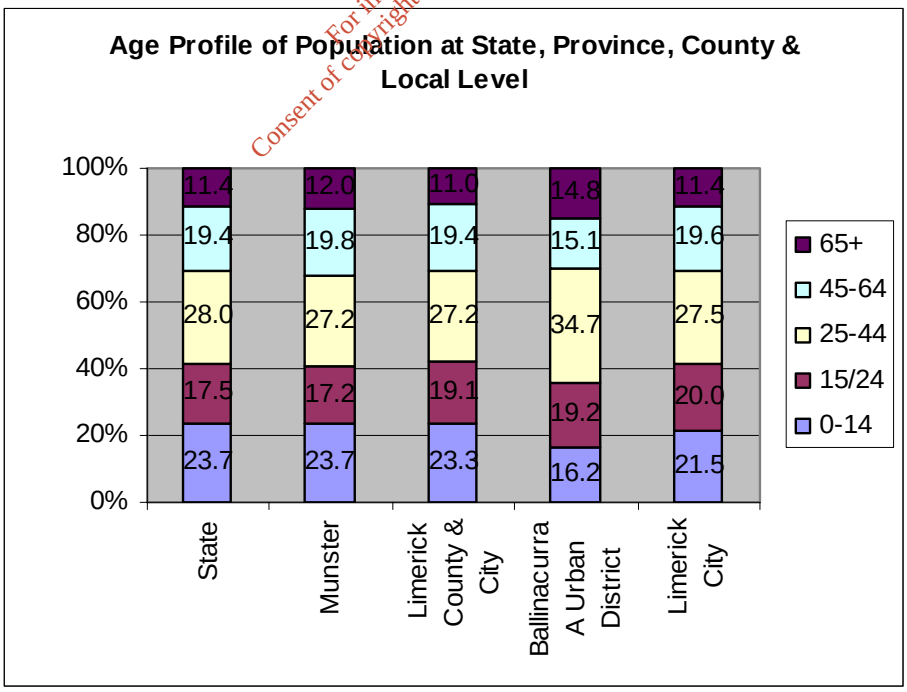
Figure 4.1: Percentage Population Change at a National, Regional and Local Level 1986 - 2002



4.2.2 Age Profile of Population

The age profile of the population of Ballinacurra District, Limerick County and City, Munster and the State are illustrated in the chart below. This chart demonstrates that largely the age profile is similar for each enumeration district.

Figure 4.2: Age Profile of Population at State, Province, County and Local Level 2002



A large proportion of the population is in the 15-24 and the 25-44 age groups, signifying a strong demand for the nature of facilities proposed within these applications. This proposal would introduce a greater variance in the age groups living in this area.

4.2.3 Impact of Proposed Development – Construction Phase

There will be no impact on the population figure of Ballinacurra A during the construction phase.

4.2.4 Impact of Proposed Development – Operational Phase

There will be an increase in the population of Ballinacurra A following the construction of the housing elements at Greenpark. Applying the average number of persons per private household in Limerick City 2.71 (Census 2002), the population of Ballinacurra A could increase by c. 2,466 persons, following the full implementation of the Masterplan objectives. This would be spread out over a ten year period. The breakdown of this increase is illustrated on the chart below.

Table 4.2 Predicted population growth at Greenpark

Area 1	157 residential units @ 2.71 persons per unit	425
Area 2: Current Application	353 residential units @ 2.71 persons per unit	957
Area 3	178 residential units @ 2.71 persons per unit	482
Area 4	222 residential units @ 2.71 persons per unit	602
Total Predicted Population		**2466**

4.3 Employment

4.3.1 Receiving Environment

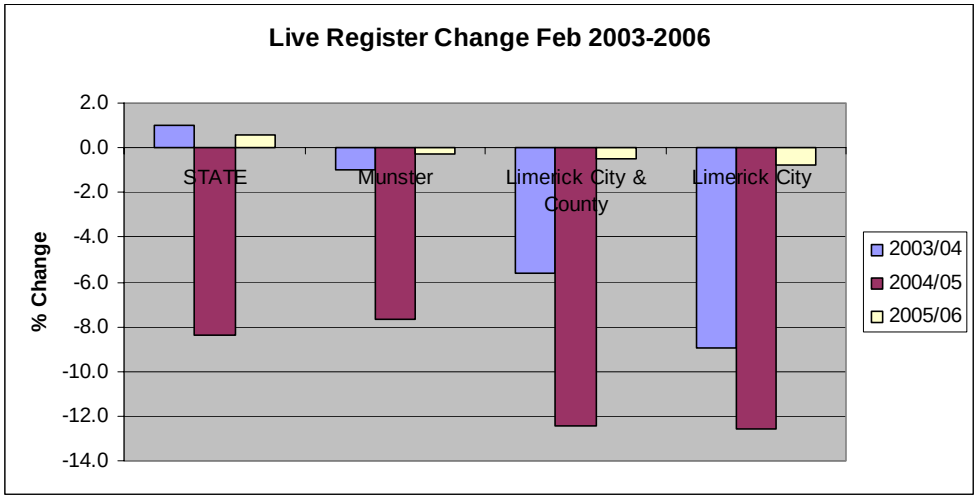
Unemployment trends in the Ballinacurra A UD area can be demonstrated by considering the Statistical Bulletin records of the Live Register. The figures supplied outline the number of persons on the Live Register for February 2003, 2004, 2005 and 2006.

Table 4.2: Live Register Figures 2003-2006

	Feb-03	Feb-04	Feb-05	Feb-06
STATE	171394	173127	158649	159617
Munster	50231	49727	45926	45812
Limerick City & County	8760	8271	7241	7204
Limerick City	6879	6264	5475	5431

Source: Live Register Monthly Analysis - Ballinacurra A UD is administered from the Limerick City office

Figure 4.3: Live Register Change 2003-2006



This illustrates that there has been a decrease in the number on the live register between February 2003 and 2006 in Limerick city and county which has experienced a larger reduction of population signing off the register than Munster and the State. The State has had a minor increase in people signing on to the Register between 2005 and 2006.

4.3.2 Construction Impacts

The proposed development will provide for additional construction related employment in Limerick City during the construction phase. An estimated 700 persons will be employed during construction, leading to a reduction in the number of persons signing onto the live register.

4.3.3 Operational Impacts

The neighbourhood centre and crèche will provide a service for the surrounding areas and will provide a number of full-time jobs. In addition, there will be some jobs provided in the maintenance of the open space elements of the scheme.

4.4 Community

4.4.1 Receiving Environment

The population of Ballinacurra A UD has increased significantly in recent years; it is paramount that services would be provided in tandem with this growth, in particular when considering that the population of this area will grow substantially once the residential elements of this scheme are constructed.

4.4.2 Construction Impacts

There will inevitably be construction impacts on the existing community. Construction impacts are expected to be short-term to medium term and are likely to include impacts associated with construction traffic, filling / raising of ground levels and any possible nuisance associated with such movements. Impacts dealing with issues such as noise and dust are assessed in later chapters.

Various elements of the development will be controlled in order to minimise disturbance and counteract potential negative impacts on residents in the vicinity. For example, construction hours will be restricted to minimise any short term loss of amenity that may be experienced by local residents.

Filling / raising of ground levels will take place over a phased period with deliveries of fill material being envisaged to occur initially at areas where proposed housing development may occur. This will involve vehicular deliveries of material.

4.4.3 Operational Impacts

The provision of additional housing will have limited operational impacts. These will mainly be increased traffic movements and an increased residential population. The zoning of the lands by Limerick City Council signifies the Council's intention that these lands should be developed.

The amenity area of the application consists of a substantial area of amenity; consisting of 4 tennis courts, a full size soccer pitch, 10 no. 5-a-side soccer pitches, open grassed areas, walks and a landscaped lagoon. These will provide an important amenity area for the proposed residential application as well as the existing population. A playground is also provided for in the residential area of the scheme.

CHAPTER FIVE: RETAIL ASSESSMENT

An assessment of the retail impact of the overall development was carried out and included in the initial EIS submitted to the Council. This reflected the proposed retail development that was subject to an application that is now withdrawn.

This has now been withdrawn and it is considered no longer necessary to present a retail impact element as part of this EIS.

CHAPTER SIX: EFFECT ON THE ENVIRONMENT - TRAFFIC

6.0 Introduction

This chapter summarises the main text of the Traffic Impact Assessment (TIA) which is submitted separately for both planning applications. Detailed appendices are attached to the TIA.

Additional Appendices are included as part of this EIS that illustrate the additional information and clarification of additional information matters raised by the Planning Authority in their assessment of the application documentation relating to traffic matters. This chapter is clarified by cross reference to and inclusion of these additional Appendices F (Information subsequent to the Further Information Request) and G (Information subsequent to the Clarification of Further Information Request).

6.1 Methodology

The methodology used in the preparation of the TIA is outlined in Chapter 3.

6.3 Forecasting Methods

The forecasting methods used to prepare the TIA are outlined in chapter 3.

6.4 Description of Existing and Proposed Development

The proposed development site is located at Greenpark within the Limerick City municipal boundary, on the site of the former Limerick Racecourse, on the southeast side of the N69 Dock Road, as shown on Figure 1 in Appendix F1. The site is also bounded by the Ballynaclough River on its southwest side, existing residential development along South Circular Road on its southeast side and the permitted residential development site (Limerick City Council Planning Register Reference Number: P99/422) on its northeast side. Access to the existing site is from South Circular Road via Greenpark Avenue.

In 2002, Limerick City Council granted planning permission, subject to conditions, to the Developers, Limerick Race Company Ltd., "for the development of lands for infrastructure to include a new roundabout on the N69 (Dock Road), roads, sewers, watermains, other underground services and landscaping (construction of the roads and services for the future development of lands)". The planning application for this infrastructure development included an Environmental Impact Statement. The planning permission was confirmed by An Bord Pleanála (Reference Number: PL 30.130232).

A further planning permission was granted by Limerick City Council, subject to conditions, to the Developers "*for a new roundabout on the N69 (Dock Road)*" (Planning Register Reference Number: P.03/343).

The proposed development comprises initially of retail, residential and leisure area developments. A schedule of the proposed development uses and gross floor areas used in the initial Traffic Assessment is set out below. This reflects the proposed retail that is now withdrawn. In summary, the initial Traffic Assessment provided for the following mix of uses:

Retail

Supermarket	-	4,800 m^2 gross floor area (g.f.a.);
Anchor Store 1 (Non-Food)	-	7,000 m^2 g.f.a.;
Anchor Store 2 (Non-Food)	-	7,000 m^2 g.f.a.;
Retail Units	-	12,081 m^2 g.f.a.;
Total Retail	=	30,881 m^2 g.f.a.
Food Court and Crèche	-	3,496 m^2 g.f.a.;

Residential		
Residential Units	-	353 residential units,
Crèche	-	540 m^2 g.f.a.;
Local Neighbourhood Centre	-	130 m^2 g.f.a. Café;
	-	140 m^2 g.f.a. Medical Office;
	-	265 m^2 Retail; and
Leisure Area	-	informal recreation areas and sports playing areas.

The gross floor areas scheduled above for the proposed retail development retail uses are the gross lettable areas.

These uses give a guide to the potential volume of development that may be accommodated on the lands subject to this and other planning permissions being permitted.

6.5 Receiving Environment

6.5.1 Existing Road Network

Adjacent to the proposed development site, Dock Road is a wide single carriageway urban distributor road, with a typical carriageway width of approximately 20.0 metres and footpaths on both sides. This existing carriageway width incorporates a continuous central ghost island to facilitate dedicated right turn lanes to existing commercial and industrial development entrances along Dock Road.

Dock Road is part of the N69 National Secondary Route from Tralee to Limerick. Adjacent to the proposed development site, Dock Road is located within the Limerick City 30 m.p.h. urban speed limit zone.

Northeast of the proposed development site, towards Limerick City centre, Dock Road forms stop controlled priority junctions with Courtbrack Avenue and Atlas Avenue. To the Southwest, Dock Road forms an at-grade roundabout controlled junction with the R510 Regional Road and the entrance to Irish Cement Ltd as shown in Figure 1 in Appendix E1. All other entrances to existing developments on Dock Road, in the vicinity of the proposed development site, are priority controlled junctions. Existing development entrances located immediately adjacent to the proposed development site include Corcanree Business Park, on the opposite side of Dock Road, and Roche's Feeds, on the same side as the proposed development site.

On the northeast side of the proposed development site, South Circular Road is a single carriageway urban collector road, serving existing residential development. The existing alignment of South Circular Road, in the vicinity of the proposed development site, includes a series of traffic calming measures.

6.5.2 Proposed Road Network

The Limerick City Development Plan 2004 road objectives include the provision of junction improvements at the existing Dock Road junctions with Courtbrack Avenue and Atlas Avenue, and the proposed junction with the new link road to the permitted development (P99/422), located north of the proposed development site and south of Courtbrack Avenue. It is envisaged that all three junctions would be traffic signal controlled junctions and would be in accordance with the plan layouts and details submitted by MHL and Associates Ltd., on behalf of McInerney Construction Ltd., for the permitted development P99/422. We understand that all three junction improvement schemes would be in place by circa 2007.

The N7 Limerick Southern Ring Road Phase 1 was opened on the 31st May 2004 and provides a bypass of Limerick City, on its southeast side, from the N20 at Rossbrien to the N7 Dublin Road at Annacotty.

We understand that the Limerick Southern Ring Road Phase 2 scheme, which extends from the N20 to the N18, via a tunnel under the River Shannon, will be subject to a Public Private Partnership (PPP) scheme. Limerick County Council, in association with Clare County Council and Limerick City Council, currently envisage that the scheme would be completed and opened by circa 2009. The scheme includes a grade separated interchange on the N69 Dock Road, approximately at the location of the existing at-grade roundabout junction with the R510 and the entrance to Irish Cement Ltd.

6.6 Existing (2004) Traffic Flows

Morning and evening peak period classified traffic turning counts were carried out by Atkins on Wednesday the 8th September 2004 at the main junctions on Dock Road, in the vicinity of the proposed development site. The recorded morning and evening peak hour traffic flows occurred between 8.00 and 9.00 a.m. and 5.00 and 6.00 p.m., respectively.

The recorded traffic flows for the morning and evening peak hour periods are shown on Figure 3 and 4 in Appendix E1, respectively. All traffic flows are expressed in total vehicles.

A summary of the recorded two-way peak hour link traffic volumes on the Dock Road network, adjacent to the proposed development site, is as follows:

Recorded 2004 Two-Way Peak Hour Traffic Volumes (vehicles)

	A.M.	P.M.
Dock Road, southwest of site	2,479	2,356
Dock Road, northeast of site	2,540	2,397
Corcanree Business Park	113	87
Courtbrack Avenue	320	320
Atlas Avenue	64	85

The recorded morning peak hour traffic flows represented the overall daily peak traffic hour on the local Dock Road network. The recorded proportion of heavy commercial vehicles (h.c.v.'s) on Dock Road was approximately 7.4% during the morning peak hour and approximately 7.8% during the evening peak hour.

The NRA DMRB Traffic Capacity of Urban Roads indicates that the link capacity of an urban all-purpose road is of the order of up to 1,620 vehicles/hour in each direction, for a UAP3 classification. Accordingly, on the basis of the recorded existing (2004) peak hour traffic flows, Dock Road is currently operating with a link volume/capacity ratio of up to approximately 83%.

6.7 Future Years Background Traffic Flows

Subject to planning permission, it is envisaged that the proposed development would be fully completed, opened and occupied during 2010. The IHT Guidelines on Traffic Impact Assessment recommend that the opening year (base year) of the full development and a plan year, 10 years after the opening year, should be considered for assessing a proposed development. In this case, the opening year is 2010 and the plan year is 2020.

As detailed in section 6.5, Limerick County Council currently envisage that the proposed Limerick Southern Ring Road Phase 2 scheme would be completed and opened by circa 2009. Subject to planning permission, it is expected that approximately 50% of the proposed residential area would be completed prior to the expected opening of the Southern Ring Road Phase 2 scheme. Whilst it is anticipated that the retail development will be under construction in 2009, it is envisaged that it will not become operational until the opening of the southern ring road phase 2 scheme in 2009.

Accordingly, an intermediate opening year of 2008 has been identified for the proposed development in order to assess the traffic impact of the proposed development prior to the opening of the Southern Ring Road Phase 2 scheme.

The NRA in their Future Traffic Forecasts 2002 – 2040 envisage that passenger car traffic and light goods vehicle traffic on national secondary routes would increase by a factor of 1.15 during the period 2004 to 2008, and by a factor of 1.21 during the period 2004 to 2010. Heavy vehicle traffic is expected to increase by a factor of 1.13 and 1.20, respectively, during the same periods.

It is envisaged that background traffic flows on the N69 Dock Road would increase by similar factors. The predicted 2008 morning and evening peak hour background traffic flows on the expected proposed development local road network are shown on Figures 5 and 6 in Appendix E1, respectively. The predicted peak hour traffic flows generated by the adjacent permitted McInerney Development, detailed in section 5.5, are in accordance with the Traffic Impact Assessment submitted by MHL and Associates Ltd., on behalf of McInerney Construction Ltd.

The Environmental Impact Statement (EIS) for the Limerick Southern Ring Road Phase 2 scheme predicts that two-way traffic volumes on the N69 Dock would decrease by 54% during the opening year of the scheme, with the proposed scheme in place.

Predicted morning and evening peak hour background traffic flows, on the proposed development local road network, have been determined for the proposed full development opening year (2010) by factoring the recorded existing (2004) traffic flows to 2010 levels, in accordance with the NRA growth factors detailed above, and reducing the resultant volumes by 54%, for the impact of the Southern Ring Road Phase 2 scheme. The predicted 2010 morning and evening peak hour background traffic flows on the expected proposed development local road network are shown on Figure 7 in Appendix E1.

The NRA Future Traffic Forecasts 2002 – 2040 predicts that passenger car traffic and light goods vehicle traffic on national secondary routes would increase by a factor of 1.18 during the period 2010 to 2020, while heavy vehicle traffic would increase by a factor of 1.22 during the same period.

It is envisaged that background traffic flows on the N69 Dock Road would increase by similar factors. Accordingly, the predicted 2020 morning and evening peak hour background traffic flows on the proposed development local road network are shown on Figure 8 in Appendix E1.

The Limerick County Council predicted morning and evening peak hour traffic flows at the proposed Limerick Southern Ring Road Phase 2 Dock Road Interchange, for the Southern Ring Road Phase 2 opening year and a 20 year horizon plan year, have been kindly provided by the Mid West National Roads Design Office at Mungret. We understand that these predicted peak hour traffic flows have been determined using the SATURN based traffic model prepared for the project. Details of these predicted flows are contained in Appendix A of the TIA.

For the purposes of this assessment, it is assumed that the predicted proposed full development opening year (2010) morning and evening peak hour background traffic flows on the Southern Ring Road Phase 2 Dock Road Interchange would be equivalent to the Limerick County Council predicted flows for the proposed Southern Ring Road Phase 2 opening year. The proposed development predicted plan year (2020) morning and evening peak hour background traffic flows on the Southern Ring Road Dock Road Interchange have been determined on a pro rata basis, in accordance with the Limerick County Council predicted Southern Ring Road Phase 2 opening year and 20 year horizon plan year morning and evening peak hour traffic flows at the interchange.

Accordingly, the predicted 2010 and 2020 morning and evening peak hour background traffic flows on the expected Southern Ring Road Phase 2 Dock Road Interchange are shown on Figures 9 and 10 in Appendix E1, respectively.

6.8 Do Nothing Impact

The predicted background morning and evening peak hour traffic flows on the proposed development envisaged local road network, detailed in section 6.5, for the proposed development intermediate opening year (2008), full opening year (2010) and plan year (2020), without the proposed development, were assessed using the following assessment criteria:

- The predicted morning and evening peak hour link volume/capacity ratios on the N69 Dock Road; and
- The highest ratio of flow to capacity, maximum degree of saturation, highest delays per vehicle and maximum queue length, as appropriate, at the local road network junctions, using the computer software ARCADY, OSCADY and PICADY. These junctions include the N69/R510 roundabout, the N69 Dock Road junctions with the Corcanree Business Park entrance, the permitted McInerney Development entrance, Courtbrack Avenue and Atlas Avenue, and the Limerick Southern Ring Road Phase 2 (LSRR2) Dock Road Interchange southern and northern roundabouts.

6.8.1 Intermediate Opening Year (2008)

On the basis of the link capacity identified in section 6.5, the N69 Dock Road would operate with a link volume/capacity ratio of up to 89.9% during the morning peak hour and 87.0% during the evening peak hour.

Full details of the ARCADY, OSCADY and PICADY junction analysis for the proposed development intermediate opening year (2008), without the proposed development in place, are provided in Appendix B of the TIA. The results are summarised as follows:

Table 6.1 2008 Without Development

Junction	Peak Hour Period	Highest Ratio of Flow to Capacity (RFC)	Highest Delays per Vehicle (minutes)	Maximum Queue Length (vehicles)
N69/R510 Roundabout	AM PM	0.55 0.79	0.11 0.15	1.5 3.8
N69 Dock Road / Corcanree Business Park	AM PM	0.21 0.39	0.58 0.49	0.3 0.6

Junction	Peak Hour Period	Maximum Degree of Saturation (%)	Highest Delay per Vehicle (minutes)	Maximum Queue Length (vehicles)
N69 Dock Road / Permitted McInerney Development Entrance	AM PM	84.1 104.0	1.28 1.51	9.2 52.7
N69 Dock Road / Courtbrack Avenue	AM PM	112.1 115.0	5.07 4.40	123.0 158.5
N69 Dock Road / Atlas Avenue	AM PM	109.9 101.3	2.96 1.54	116.9 30.7

The OSCADY analysis of the traffic signal controlled junctions is based on a fixed cycle time of 90 seconds. OSCADY identifies a degree of saturation of 90% as representing the practical capacity of a traffic signal controlled junction, while a ratio of flow to capacity of 0.90 for a priority controlled junction and roundabout junction is considered to represent typical practical capacity.

The above analysis indicates that the N69/510 roundabout junction and the N69 Dock Road/Corcanree Business Park entrance junction would operate within practical capacity, during both the morning and evening peak hour periods, while the N69 Dock Road/permitted McInerney Development entrance junction would operate within practical capacity during the morning peak hour.

The N69 Dock Road junctions with Courtbrack Avenue and Atlas Avenue would operate in excess of capacity during both the morning and evening peak hour periods, while the permitted McInerney Development entrance junction would also operate in excess of capacity during the evening peak hour.

6.8.2 Full Opening Year (2010)

On the basis of the link capacity identified in section 6.6, the N69 Dock Road would operate with a link volume/capacity ratio of up to 43.9% during the morning peak hour and 41.6% during the evening peak hour.

Full details of the ARCADY, OSCADY and PICADY junction analysis for the proposed development full opening year (2010), without the proposed development in place, are provided in Appendix C of the TIA. The results are summarised as follows:

Table 6.2 2010 Without Development

Junction	Peak Hour Period	Highest Ratio of Flow to Capacity (RFC)	Highest Delays per Vehicle (minutes)	Maximum Queue Length (vehicles)
LSRR2 Dock Road Interchange Southern Roundabout	AM PM	0.70 0.58	0.15 0.15	2.3 1.4
LSRR2 Dock Road Interchange Northern Roundabout	AM PM	0.75 0.68	0.14 0.09	3.0 2.1
N69 Dock Road / Corcanree Business Park	AM PM	0.13 0.15	0.16 0.15	0.1 0.2

Junction	Peak Hour Period	Maximum Degree of Saturation (%)	Highest Delays per Vehicle (minutes)	Maximum Queue Length (vehicles)
N69 Dock Road / Permitted McInerney Development Entrance	AM PM	49.1 46.0	0.80 0.82	4.1 2.9
N69 Dock Road / Courtbrack Avenue	AM PM	68.3 49.1	0.65 0.82	7.4 3.9
N69 Dock Road / Atlas Avenue	AM PM	49.9 50.0	0.82 0.88	4.3 3.8

The above analysis indicates that the proposed development envisaged local road network junctions, on the N69 Dock Road, and the Limerick Southern Ring Road Phase 2 Dock Road Interchange southern and northern roundabout junctions, would operate within practical capacity.

6.8.3 Plan Year (2020)

On the basis of the link capacity identified in section 6.6, the N69 Dock Road would operate with a link volume/capacity ratio of up to 51.5% during the morning peak hour and 49.2% during the evening peak hour.

Full details of the ARCADY, OSCADY and PICADY junction analysis for the proposed development plan year (2020), without the proposed development in place, are provided in Appendix D of the TIA. The results are summarised as follows:

Table 6.3 2020 Without Development

Junction	Peak Hour Period	Highest Ratio of Flow to Capacity (RFC)	Highest Delays per Vehicle (minutes)	Maximum Queue Length (vehicles)
LSRR2 Dock Road Interchange Southern Roundabout	AM PM	0.86 0.39	0.32 0.08	5.8 0.6
LSRR2 Dock Road Interchange Northern Roundabout	AM PM	0.76 0.82	0.22 0.15	3.2 4.5
N69 Dock Road / Corcanree Business Park	AM PM	0.16 0.20	0.18 0.17	0.2 0.2

Junction	Peak Hour Period	Maximum Degree of Saturation (%)	Highest Delays per Vehicle (minutes)	Maximum Queue Length (vehicles)
N69 Dock Road / Permitted McInerney Development Entrance	AM PM	54.8 56.0	0.83 0.85	5.0 3.5
N69 Dock Road / Courtbrack Avenue	AM PM	76.0 58.8	0.69 0.86	9.0 4.7
N69 Dock Road / Atlas Avenue	AM PM	61.6 57.3	0.87 0.94	5.2 4.6

The above analysis indicates that the proposed development envisaged local road network junctions, on the N69 Dock Road, and the Limerick Southern Ring Road Phase 2 Dock Road Interchange southern and northern roundabout junctions, would operate within practical capacity.

6.9 Parking

The parking provisions of any development within the Limerick City Council administrative area are required to be in accordance with the parking standards set down in the Limerick City Development Plan 2004. The Development Plan provides defined parking standards for both the city centre and the city suburbs.

A summary of the Limerick City Council parking standards and parking supply proposed for the proposed development is as follows:

Table 6.4 Parking Standards and Supply

Development Type	Floor Area m^2	Minimum Parking Standard	Spaces Required	Spaces Proposed
Retail Supermarket, Anchor Store 1, Anchor Store 2, Retail Units, Food Court and Crèche	34,377 m^2	1/22 m^2	1,563	1,862
Residential Houses & Duplexes Apartments Crèche	196 units 157 units 540 m^2 (capacity for 50 children)	2/unit 1.25/unit 1/5 children	392 163 10	448 246 10
Local Neighbourhood Centre Café Medical Office Retail	130 m^2 public space 140 m^2 2 consulting rooms 265 m^2	1/20 m^2 2/room 1/25 m^2	7 4 11	6 4 11
Leisure Area				80

The proposed retail development includes a total of 1,862 parking spaces, comprising 939 basement spaces, 752 surface spaces and 171 staff parking spaces located at the rear of the proposed building.

The parking spaces proposed for the residential development includes provision for visitor parking at the houses, duplexes and apartments.

6.10 Proposed Development Access

Access to the proposed development is proposed via a single at-grade entrance on the existing N69 Dock Road, as shown on Figures 1 and 2 in Appendix E1.

The proposed entrance junction would be in accordance with the existing planning permissions granted by Limerick City Council, detailed in sections 6.4, for a new at-grade roundabout junction.

6.11 Proposed Development Traffic Generation and Distribution

With the proposed development in place, total traffic volumes on the surrounding local road network would be highest during the weekday morning and evening peak hour periods, when the combined predicted background traffic volumes and traffic generation by the proposed development retail and residential uses would be highest.

Morning and evening peak hour traffic generation estimates for the proposed development have been determined on the basis of the IHT TRICS, with low public transport availability. The trip rates provided by TRICS are consistent with those recorded nationally by Atkins for similar development uses.

On this basis, the calculation of the predicted traffic generated by the proposed development is as follows:

Retail

Supermarket, Anchor Store 1 and 2 and Retail Units

Total gross lettable retail area	=	30,881 m^2
During the morning peak hour:		
1.85 trips/100 m^2 inbound	=	571 trips
1.13 trips/100m^2 outbound	=	349 trips
During the evening peak hour:		
3.59 trips/100 m^2 inbound	=	1,109 trips
3.74 trips/100 m^2 outbound	=	1,155 trips

Food Court and Crèche

It is assumed that the Food Court and crèche would not generate any additional external trips.

Residential

Houses and Duplexes

Total number of houses and duplex units	=	196 units
During the morning peak hour:		
0.17 trips/unit inbound	=	33 trips
0.74 trips/unit outbound	=	145 trips
During the evening peak hour:		
0.57 trips/unit inbound	=	112 trips
0.23 trips/unit outbound	=	45 trips

Apartments

Total number of apartment units	=	157 units
During the morning peak hour:		
0.13 trips/unit inbound	=	20 trips
0.42 trips/unit outbound	=	66 trips
During the evening peak hour:		
0.37 trips/unit inbound	=	58 trips
0.16 trips/unit outbound	=	25 trips

Local Neighbourhood Centre and Crèche

It is assumed that the local neighbourhood centre and crèche would not generate any external trips.

Leisure Area

The proposed leisure area does not include any proposed building uses. It is proposed to provide a dedicated off-street car park, adjacent to the proposed informal recreation areas and sports playing areas, with 80 car parking spaces. Weekday morning and evening peak hour

traffic generation estimates for the leisure area have been estimated on the basis of the proposed parking supply, as set out hereunder.

Total proposed parking supply = 80 spaces

During the morning peak hour:
Trip rate of 10% of parking supply inbound = 8 trips
Trip rate of 10% of parking supply outbound = 8 trips

During the evening peak hour:
Trip rate of 20% of parking supply inbound = 16 trips
Trip rate of 20% of parking supply outbound = 16 trips

The proposed retail development uses include a series of food and non-food mixed retail uses, for which TRICS identifies separate defined trip generation rates. For the purpose of this mixed retail development, predicted trip generation rates have been assumed for the total retail development gross lettable area. During the evening peak hour, from 5.00 to 6.00 p.m. the predicted two-way trip generation equates to a generation rate of 1.45 cars per car parking space required by the Limerick City Development Plan 2004 for the entire retail and foodcourt development, which is considered a typical evening peak for retail developments nationally. The equivalent predicted rate during the morning peak hour, from 8.00 to 9.00 p.m., when many of the retail units would be closed, is 0.59 cars per car space required. Accordingly, it is considered that the predicted trip generation rates for the total retail development gross lettable area is a robust basis for the assessment of the traffic impact of the proposed retail development during the morning and evening peak hour periods.

A summary of the predicted morning and evening peak hour traffic generation for the proposed development is as follows:

	Predicted Development Peak Hour Traffic Generation (Trips)					
	Morning Peak Hour			Evening Peak Hour		
	In	Out	Total	In	Out	Total
Retail	571	349	920	1,109	1,155	2,264
Residential	53	211	264	170	70	240
Leisure Area	8	8	16	16	16	32
Total:	632	568	1,200	1,295	1,241	2,536

Estimates of the distribution of traffic generated by the proposed development residential and leisure area uses have been made on the basis of the recorded existing (2004) peak hour traffic flows and the predicted background traffic flows with the proposed Limerick Southern Ring Road Phase 2 scheme in place, as appropriate.

Prior to the expected completion of the Limerick Southern Ring Road Phase 2 (LSRR2) in 2009, it is envisaged that the distribution of peak hour traffic generated by the partly completed residential development and leisure area on the local road network would be as follows:

Predicted Proposed Development Residential and Leisure Area Peak Hour Traffic Distribution Prior to Opening of LSRR2 (%)

Dock Road, east of development entrance	62%
Dock Road, west of development entrance	37%
Corcanree Business Park	1%
Dock Road, east of Courtbrack Avenue	37%
Courtbrack Avenue	25%

After the expected opening of the Southern Ring Road Phase 2 in 2009, the predicted distribution of peak hour traffic generated by the residential development and leisure area on the surrounding local road network is as follows:

Predicted Proposed Development Residential and Leisure Area Peak Hour Traffic Distribution after Opening of LSRR2 (%)

Dock Road, east of development entrance	60%
Dock Road, west of development entrance	39%
Corcanree Business Park	1%
Dock Road, east of Courtbrack Avenue	24%
Courtbrack Avenue	15%
N69, south of LSRR2	5%
R510	5%
LSRR2, east of Dock Road Interchange	35%
LSRR2, west of Dock Road Interchange	15%

It is envisaged that the proposed retail development would not be completed until 2010, after the expected opening of the Southern Ring Road Phase 2 in 2009. The predicted distribution of peak hour traffic generated by the proposed retail development has been determined on the basis of the population distribution within an approximate 30 minutes travel time by car of the development, and is as follows:

Predicted Proposed Retail Development Peak Hour Traffic Distribution (%)

Dock Road, east of development entrance	74%
Dock Road, west of development entrance	24%
Corcanree Business Park	1%
Proposed Residential Development	1%
Dock Road, east of Courtbrack Avenue	20%
Courtbrack Avenue	4%
N69, south of LSRR2	9%
R510	5%
LSRR2, east of Dock Road Interchange	45%
LSRR2, west of Dock Road Interchange	15%

6.12 Likely Effects of this Proposal

It is assumed that all predicted trips generated by the proposed residential development and leisure area, during the weekday morning and evening peak hours, would be new traffic on the proposed development local road network.

The IHT Guidelines for Traffic Impact Assessment indicates that typically 30% of weekday peak hour trips generated by retail superstores are existing home/work based pass by trips. In this case, it is conservatively assumed that 20% of all predicted weekday morning and evening peak hour retail trips would be pass by trips.

The predicted future background morning and evening peak hour traffic flows on the proposed development local road network have been determined in the context of the Limerick Southern Ring Road EIS and the SATURN based traffic model prepared for the project. As indicated in section 6.3, we understand that this model represents an extension to the model prepared for the Limerick PLUTS. The proposed development site is currently unused, and the Limerick City Development Plan 2004 zoning uses for the site include general purposes. As previously indicated, the proposed development site has an existing infrastructure planning permission. The EIS submitted to Limerick City Council in relation to planning permission P99/422, detailed development generated traffic on Dock Road based on 65,000 m^2 g.f.a. of commercial offices and 460 housing units. Accordingly, the SATURN model would have included zone connector(s) and a trip loading for this existing large unused site for its future traffic predictions.

For the purposes of this assessment, it is conservatively assumed that the equivalent of 10% of the proposed development new trips have been assumed in the SATURN model for the proposed development site. This would equate to only 4.7% and 12.3%, respectively, of the

morning and evening peak hour predicted new traffic generated by the proposed development site in the EIS for the infrastructure planning permission.

The predicted development traffic generation, summarised in section 6.11, was assigned to the surrounding envisaged local road network, in accordance with the above assumptions, the predicted distribution detailed in sections 6.11, inclusive, and the phased completion programme, detailed in sections 6.7, inclusive.

The predicted 2008, 2010 and 2020 morning and evening peak hour traffic flows on the proposed development local road network, with the proposed development in place, are shown on Figures 11, 12, 13, 14, 15 and 16 in Appendix E1, respectively.

The impact of the predicted proposed development morning and evening peak hour traffic flows on the envisaged local road network, during the intermediate opening year (2008), full opening year (2010) and plan year (2020), was assessed using the following assessment criteria:

- The predicted morning and evening peak hour two-way link traffic flows, with and without the proposed development;
- The predicted morning and evening peak hour link volume/capacity ratios on the N69 Dock Road; and
- The highest ratio of flow to capacity, maximum degree of saturation, highest delays per vehicle and maximum queue length, as appropriate, at the local road network junctions, using the computer software ARCADY and OSCADY. These junctions include the N69/R510 roundabout, the N69/proposed Development entrance roundabout, the N69 Dock Road junctions with the permitted McInerney Development entrance, Courtbrack Avenue and Atlas Avenue, and the Limerick Southern Ring Road Phase 2 (LSRR2) Dock Road Interchange southern and northern roundabouts.

6.12.1 Intermediate Opening Year (2008)

On the basis of the link capacity identified in section 6.6, the N69 Dock Road would operate with a link volume/capacity ratio of up to 90.6% during the morning peak hour and 89.3% during the evening peak hour, with the proposed development (part) in place. This compares to 89.9% and 87.0%, respectively, without the proposed development.

A summary of the impact of the proposed development on two-way morning and evening peak hour traffic flows on the envisaged local road network is as follows:

Table 6.5 Predicted 2008 Two-Way Peak Hour Traffic Flows (vehicles)

	Predicted 2008 Two-Way Peak Hour Traffic Flows (vehicles)					
	Without Development		With Development		Change	
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.
Dock Road, west of Development Entrance	2,547	2,593	2,601	2,646	+54	+53
Dock Road, east of Development Entrance	2,614	2,638	2,703	2,723	+89	+85
Dock Road, west of Courtbrack Avenue	2,472	2,380	2,561	2,465	+89	+85
Dock Road, east of Atlas Avenue	2,679	2,478	2,732	2,528	+53	+50
N69, west of R510	831	829	842	844	+11	+15
R510, south of N69	1,793	1,876	1,837	1,914	+44	+38
Courtbrack Avenue, south of Dock Road	610	372	646	407	+36	+35
Proposed Development Entrance	N/A	N/A	145	139	+145	+139

With the proposed development in place, the highest increase in two-way traffic flows would occur on Dock Road, between the proposed development entrance and Courtbrack Avenue, with an increase of 89 vehicles during the morning peak hour and 85 vehicles during the evening peak hour.

Full details of the ARCADY and OSCADY junction analysis for the proposed development intermediate year (2008), with the proposed development (part) in place, are provided in Appendix E of the TIA. The results are summarised as follows:

Table 6.6 2008 with Development (part)

Junction	Peak Hour Period	Highest Ratio of Flow to Capacity (RFC)	Highest Delays per Vehicle (minutes)	Maximum Queue Length (vehicles)
N69/R510 Roundabout	AM PM	0.62 0.80	0.11 0.16	1.7 4.0
N69 Dock Road / Proposed Development Entrance Roundabout	AM PM	0.69 0.72	0.10 0.10	2.2 2.6

Junction	Peak Hour Period	Maximum Degree of Saturation (%)	Highest Delays per Vehicle (minutes)	Maximum Queue Length (vehicles)
N69 Dock Road / Permitted McInerney Development Entrance	AM PM	89.0 104.6	1.32 1.65	9.4 57.7
N69 Dock Road / Courtbrack Avenue	AM PM	123.3 122.1	8.17 6.43	223.1 227.0
N69 Dock Road / Atlas Avenue	AM PM	112.1 104.0	3.58 1.54	142.2 52.4

The above analysis indicates that the N69/R510 roundabout junction and the N69 Dock Road/proposed Development entrance junction would operate within practical capacity during both the morning and evening peak hour periods, while the N69 Dock Road/permitted McInerney Development entrance junction would operate within practical capacity during the morning peak hour.

As in the scenario without the proposed development, the N69 Dock Road junctions with Courtbrack Avenue and Atlas Avenue would operate in excess of capacity during both the morning and evening peak hour periods, with the permitted McInerney Development entrance junction operating in excess of capacity during the evening peak hour. With the proposed development (part) in place, the highest Ratio of Flow to Capacity (RFC) would increase from 115.0 to 123.3 at the Courtbrack Avenue junction, from 109.9 to 112.1 at the Atlas Avenue junction, and from 104.0 to 104.6 at the permitted McInerney Development entrance junction.

6.12.2 Full Opening year (2010)

On the basis of the link capacity identified in section 6.6, the N69 Dock Road would operate with a link volume/capacity ratio of up to 59.9% during the morning peak and 92.4% during the evening peak hour, with the proposed development in place. This compares to 43.9% and 41.6%, respectively, without the proposed development.

A summary of the impact of the proposed development on two-way morning and evening peak hour traffic flows on the envisaged local road network is as follows:

Table 6.7	Predicted 2010 Two-Way Peak Hour Traffic Flows (vehicles)					
	Without Development		With Development		Change	
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.
Dock Road, west of Development Entrance	1,200	1,260	1,880	2,758	+680	+1,498
Dock Road at Development Entrance	1,267	1,305	1,426	1,610	+159	+305
Dock Road, west of Courtbrack Avenue	1,169	1,071	1,427	1,559	+258	+488
Dock Road, east of Atlas Avenue	1,376	1,189	1,570	1,575	+194	+386
N69, west of R510	1,438	1,588	1,510	1,747	+72	+159
R510, south of N69	1,151	775	1,195	865	+44	+90
Courtbrack Avenue, south of Dock Road	610	372	674	474	+64	+102
Proposed Development Entrance	N/A	N/A	1,200	2,519	+1,200	+2,519
LSRR2, west of Dock Road Interchange					+139	+281
LSRR2, east of Dock Road Interchange					+390	+826

With the proposed development in place, the highest increase in two-way traffic flows would occur on Dock Road, between the proposed development entrance and the Dock Road Interchange northern roundabout, with an increase of 1,498 vehicles during the evening peak hour and 680 vehicles during the morning peak hour. Two-way traffic flows would increase by up to 826 vehicles on the Southern Ring Road during the evening peak hour, and by up to 390 vehicles during the morning peak hour.

Full details of the ARCADY and PICADY junction analysis for the proposed development opening year (2010), with the proposed development in place, are provided in Appendix F of the TIA.

The results are summarised as follows:

Table 6.8 2010 with Development

Junction	Peak Hour Period	Highest Ratio of Flow to Capacity (RFC)	Highest Delays per Vehicle (minutes)	Maximum Queue Length (vehicles)
LSRR2 Dock Road Interchange Southern Roundabout	AM PM	0.88 1.01	0.37 1.7	7.0 26.0
LSRR2 Dock Road Interchange Northern Roundabout	AM PM	0.93 1.01	0.47 1.13	11.8 59.3
N69 Dock Road / Proposed Development Entrance Junction	AM PM	0.51 0.85	0.07 0.25	1.0 5.5

Junction	Peak Hour Period	Maximum Degree of Saturation (%)	Highest Delays per Vehicle (minutes)	Maximum Queue Length (vehicles)
N69 Dock Road / Permitted McInerney Development Entrance	AM PM	53.2 52.5	0.86 0.89	4.8 4.4
N69 Dock Road / Courtbrack Avenue	AM PM	75.3 75.6	0.73 0.93	8.4 5.6
N69 Dock Road / Atlas Avenue	AM PM	57.8 62.4	0.82 1.02	5.0 5.0

The above analysis indicates that the proposed Dock Road Interchange southern roundabout would operate within practical capacity during the morning peak hour and in excess of practical capacity during the evening peak hour, with highest RFC's of 0.88 and 1.01, respectively. This compares to highest RFC's of 0.70 and 0.58, respectively, without the proposed development.

The Dock Road Interchange northern roundabout would operate in excess of practical capacity during both peak hour periods, with highest RFC's of 0.93 and 1.01, respectively. This compares to highest RFC's of 0.75 and 0.68, respectively, without the proposed development.

The proposed development entrance junction and the other N69 junctions analysed would operate within practical capacity during both the morning and evening peak hour periods.

6.12.3 Plan Year (2020)

On the basis of the link capacity identified in section 6.6, the N69 Dock Road would operate with a link volume/capacity ratio of up to 67.2% during the morning peak hour and 100.0% during the evening peak hour, with the proposed development in place. This compares to 51.5% and 49.2%, respectively, without the proposed development.

A summary of the impact of the proposed development on two-way morning and evening peak hour traffic flows on the envisaged local road network is as follows:

Table 6.9	Predicted 2020 Two-Way Peak Hour Traffic Flows (vehicles)					
	Without Development		With Development		Change	
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.
Dock Road, west of Development Entrance	1,420	1,491	2,100	2,989	+680	+1,498
Dock Road, at Development Entrance	1,499	1,544	1,658	1,849	+159	+305
Dock Road west of Courtbrack Avenue	1,383	1,267	1,641	1,755	+258	+488
Dock Road, east of Atlas Avenue	1,628	1,407	1,822	1,793	+194	+386
N69, west of R510	1,477	1,305	1,549	1,464	+72	+159
R510, south of N69	655	624	699	714	+44	+90
Courtbrack Avenue, south of Dock Road	722	440	786	542	+64	+102
Proposed Development Entrance	N/A	N/A	1,200	2,519	+1,200	+2,519
LSRR2, west of Dock Road Interchange					+139	+281
LSRR2, east of Dock Road Interchange					+390	+826

With the proposed development in place, the highest increase in two-way traffic flows would occur on Dock Road, between the proposed development entrance and the Dock Road Interchange northern roundabout, with an increase of 1,498 vehicles during the evening peak hour and 680 vehicles during the morning peak hour. Two-way traffic flows would increase by up to 826 vehicles on the Southern Ring Road during the evening peak hour, and by up to 390 vehicles during the morning peak hour.

Full details of the ARCADY and OSCADY junction analysis for the proposed development plan year (2020), with the proposed development in place, are provided in Appendix G of the TIA. The results are summarised as follows:

Table 6.10 2020 with Development

Junction	Peak Hour Period	Highest Ratio of Flow to Capacity (RFC)	Highest Delays per Vehicle (minutes)	Maximum Queue Length (vehicles)
LSRR2 Dock Road Interchange Southern Roundabout	AM PM	1.09 0.65	3.15 0.15	94.8 1.8
LSRR2 Dock Road Interchange Northern Roundabout	AM PM	0.98 1.13	0.99 4.18	20.6 287.8
N69 Dock Road / Proposed Development Entrance Junction	AM PM	0.57 0.90	0.08 0.38	1.3 8.7

Junction	Peak Hour Period	Maximum Degree of Saturation (%)	Highest Delays per Vehicle (minutes)	Maximum Queue Length (vehicles)
N69 Dock Road / Permitted McInerney Development Entrance	AM PM	58.9 76.7	0.89 1.04	5.8 5.1
N69 Dock Road / Courtbrack Avenue	AM PM	89.6 89.7	1.02 1.54	12.0 8.0
N69 Dock Road / Atlas Avenue	AM PM	70.4 74.4	0.87 1.12	6.0 5.9

The above analysis indicates that the proposed Dock Road Interchange southern roundabout would operate in excess of capacity during the morning peak hour, with a highest RFC of 1.09, and within practical capacity during the evening peak hour with a highest RFC of 0.65. This compares to highest RFC's of 0.86 and 0.39, respectively, without the proposed development.

The Dock Road Interchange northern roundabout would operate in excess of practical capacity during both peak hour periods, with highest RFC's of 0.98 and 1.13, respectively. This compares to highest RFC's of 0.76 and 0.82, respectively, without the proposed development.

The proposed development entrance junction and the other N69 junctions analysed would operate at, or within, practical capacity during both the morning and evening peak hour periods.

6.13 Mitigation

The foregoing analysis indicates that, prior to the opening of the Limerick Southern Ring Road Phase 2, the critical traffic signal controlled junctions envisaged on the N69 Dock Road would operate in excess of capacity, without the proposed development in place, during 2008. The expected opening of the Southern Ring Road Phase 2 in circa 2009 would significantly reduce traffic flows on the N69 Dock Road and increase the reserve capacity of these critical traffic signal controlled junctions. With the proposed development in place, these junctions would operate well within practical capacity during 2010, and within, or at, practical capacity in 2020.

With the proposed development in place, the critical approaches to the Dock Road Interchange roundabout would operate in excess of practical capacity. However, the majority of the approaches to the roundabouts would be within practical capacity.

The analysis is based on the manual distribution of the predicted proposed development traffic. The availability of reserve capacity at the traffic signal controlled junctions on the N69 Dock Road, east of the proposed development entrance, would facilitate a redistribution of development generated new trips from the Dock Road Interchange, based on the assigned quickest route for each trip, as appropriate. This would reduce the predicted highest RFC's at the Dock Road Interchange roundabouts.

In addition, the level of the proposed development retail pass by trips assumed in the analysis is less than that considered typical by the IHT.

We understand that Limerick City Council are currently updating the SATURN based model, used for the Limerick Southern Ring Road Phase 2 project, in preparation for the PPP scheme for the project. A review of the zoning, zone connectors and trip generation and attraction matrix, assigned in the model for the proposed development site, could indicate a higher trip loading than that assumed in this assessment.

6.14 Construction Traffic

The expected construction period for the proposed development is approximately five years. It is envisaged that construction would initially commence on the proposed residential development and leisure area uses. The construction of the proposed retail development was initially expected to commence in circa 2007 prior to its withdrawal with a construction programme of approximately two and a half years.

Peak construction on-site employment and deliveries would occur during the retail construction phase. It is envisaged that the majority of construction workers would arrive on-site before the morning peak traffic hour, and depart before the evening peak traffic hour. Peak daily construction deliveries to the site are expected to be of the order of up to 50 delivery vehicles. Additional construction traffic to the site will be associated with other permitted development and the proposed increase in the levels of the site to be achieved through filling of the site. This will involve a significant volume of fill which will be placed on the site in a phased basis with the residential and leisure areas receiving the initial phases of filling.

Whilst this filling will be carried out under the auspices of a Construction Management Plan prepare by the appointed contractor with appropriate consultation from the Planning Authority the likely duration for the filling of the residential area may be in the region of 6 months subject to weather conditions and overall site development considerations. This may be over one period or phased over a number of periods subject to constraints. This could be on the basis of ten 30 tonne trucks inbound and outbound per hour over a 12 hour period carrying approx. 16.66 m3 of material into the site; subsequently leaving the site empty.

Construction site offices, compounds and parking would be located within the site confines. All necessary construction warning signs and other measures required by Limerick City Council would be provided at the commencement of construction.

CHAPTER SEVEN: EFFECT ON THE ENVIRONMENT: LANDSCAPE AND VISUAL APPRAISAL

7.1 INTRODUCTION

Cunnane Stratton Reynolds Ltd were commissioned to carry out the Landscape and Visual Impact Assessment component of an EIS for the proposed redevelopment of the Greenpark Racecourse located on the southern fringe of Limerick City off the Dock Road. The assessment was carried out by a Chartered Landscape Architect in September 2004 and takes into account all level changes proposed as part of the planning application.

7.2 METHODOLOGY

This Landscape and Visual Impact Assessment (LVIA) is in accordance with the EPA's *Guidelines on the Information to be Contained in an Environmental Impact Statement,* 2002*,* and the Landscape Institute (UK) *Guidelines for Landscape and Visual Impact Assessment* (Second Edition), 2002, from which the methodology is derived*.*

The Guidelines prescribe that landscape and visual impacts be assessed by separate, although linked procedures. Landscape assessment considers the effects deriving from alterations to the elements and characteristics of the landscape, which may give rise to changes in its character, how it is experienced and hence the ascribed value of the landscape or townscape, (the term townscape is used to describe the urban landscape). Visual impact assessment is concerned with changes that arise in the composition of available views, the response of people to these changes and the overall effects on the area's visual amenity.

Preparation for the report included:

- Desktop study of available maps and other relevant data
- Site Survey
- Physical survey of surrounding environment to establish likely visual envelope
- Development of a photographic record

7.2.1 Format

In order to meet the requirements of the relevant guidelines, the landscape and visual impact assessment takes the following form:

- *Description of the proposed development* in terms of those characteristics that will have landscape and visual effects.

- *Description of the receiving environment*, identifying its key elements and characteristics. This description of the landscape character of the site and surrounds forms the basis of the landscape impact assessment and informs the identification of viewpoints to be assessed for visual amenity impact.

- *The receiving environment and its capacity to accommodate change*. This will discuss landscape / townscape character impact and visual impact and will include a detailed assessment of the proposed development from selected / representative viewpoints within the developments zone of visual influence.

- *Conclusion*. Finally a conclusion is drawn as to the appropriateness of the proposed development in landscape and visual impact terms.

The following are discussed:

The 'do nothing' scenario, i.e. the receiving environment as it would be in the future if no development of the Site were to take place is discussed.

The ameliorative, remedial or reductive measures built into the proposed development in consideration of its potential landscape and visual impact are considered.

The results of the landscape and visual impact assessments.

7.3 Terminology and criteria

The potential landscape impact assessment describes the likely nature and scale of changes to individual landscape elements and characteristics, and the consequential effect on landscape character. Existing trends of change in the landscape are taken into account. The potential landscape impact is assessed based on:

(a) the sensitivity of the landscape resource, which is a function of its land use, landscape patterns and scale, visual enclosure and distribution of visual receptors and the value placed on the landscape. The landscape sensitivity maybe classified as; (i) High (exhibits a very strong positive character with valued elements and characteristics that combine to give an experience of unity, richness and harmony, therefore particularly sensitive to change in general), (ii) Medium (exhibits positive character but has evidence of alteration to / degradation / erosion of elements and characteristics resulting in an area of mixed character, therefore potentially sensitive to change in general, or (iii) Low (exhibits generally negative character with few valued elements or characteristics), and;

(b) the scale or magnitude of landscape effects or the quantity of change to be imposed on the landscape by the development. The magnitude of change to the landscape maybe classified as; (i) High (total loss of or major alteration to the key elements or characteristics of the landscape, and / or introduction of elements considered totally uncharacteristic in the context of the receiving environment's landscape character), (ii) Medium (partial loss of or alteration to one or more key elements or features, and / or introduction of elements that may be prominent but may not necessarily be considered to be substantially uncharacteristic in the context of the receiving environment), (iii) Low (minor loss of or alteration to one or more key elements or characteristics, and / or introduction of elements that may not be uncharacteristic in the context), or (iv) Negligible (very minor loss, alteration or introduction of elements of the landscape).

As a general rule, the greater the distance of the viewpoint from the site, the smaller degree of impact it will be considered to have.

Visual envelope

A visual envelope is used to describe the extent of the developments visual affect on the surrounding environment, illustrated through the creation of a visual envelope map. The extent of visual intrusion the development has on the surrounding environment is dependent upon a variety of factors such as landform, existing vegetation and surrounding built form. It should be noted these maps are indicative only and it is not normally possible to assign a tolerance to them.

The potential visual impact assessment describes the changes in the character of the available views and the changes in the visual amenity of the visual receptors for a number of places / viewpoints selected to represent the receiving environment within the visual envelope and its users and inhabitants. For each viewpoint the field of view towards the site is described in terms of its key elements or characteristics.

The descriptions are illustrated with photographs taken from the viewpoints, (taken with 50mm lens to illustrate as closely as possible an 'as the eye sees' image – photographs may be stitched together to create panorama in some instances), to illustrate the proposed change to the view. The potential visual impact on each viewpoint is assessed based on:

(a) the sensitivity of the visual receptors, which is a function of the location and context of the viewpoint, the expectations and occupation or activity of the receptor, and the importance of the view. Viewpoint sensitivity is classified as High (e.g. users of outdoor recreation facilities or

centres of activity focused on the landscape, and occupiers of residential properties with views affected by the development), Medium (e.g. people travelling through or past the affected landscape in cars or on public transport, i.e. viewing but not focused on the landscape), or Low (e.g. people at their place of work or engaged in similar activities such as shopping, etc., whose attention will be focused on these activities).

(b) the scale or magnitude of visual effects or the degree / quantity of change to the field of view (towards the site) resulting from the development. This takes into account the extent of the view that would be occupied by the intrusion, e.g. full, partial, glimpse, etc. including the distance of the viewpoint from the development and its effect on the importance of the development in the field of view, the proportion of the development or particular features that would be visible, and whether the view of the development would be static, or a sequence or transient (as seen from a moving vehicle). The magnitude of change to each view is classified as High (total loss of or major alteration to the key elements or characteristics of the view, and / or introduction of elements considered totally uncharacteristic in the context of the view), Medium (partial loss of or alteration to one or more key elements or features, and / or introduction of elements that may be prominent but may not necessarily be considered to be substantially uncharacteristic in the context of the view), Low (minor loss of or alteration to one or more key elements or characteristics, and / or introduction of elements that mat not be uncharacteristic in the context), or Negligible (very minor loss, alteration or introduction of elements of the view).

Landscape impact

A statement is made as to the significance of the landscape impact that would result from the development, based on the measurement of the magnitude of the landscape effects against the sensitivity of the landscape resource. The predicted impact is classified as high, medium or low as well as beneficial, neutral or adverse. This is not an absolute exercise; it is a professional judgement informed by the assessment methodology described.

Visual Amenity

Each viewpoint, is categorized in tabular form summarising the significance of the predicted impact on the visual amenity of the view, as well as a classification of the impact as beneficial, neutral or adverse. The assessment of the significance of impact on each view is based on the measurement of the magnitude of change to the view against the sensitivity of the viewpoint.

The criteria for grading impact significance are summarised as follows:

• Where a viewpoint of High sensitivity is subject to a High or Medium magnitude of change, then the impact is classified as of High significance, and
• Where a viewpoint of Medium sensitivity is subject to a High magnitude of change, then the impact is classified as of High significance.

• Where a viewpoint of Medium sensitivity is subject to a Medium or Low magnitude of change, then the impact is classified as of Medium significance, and
• Where a viewpoint of High sensitivity is subject to a Low magnitude of change, then the impact is classified as of Medium significance.

• Where a viewpoint of Low sensitivity is subject to a High, Medium, Low or Negligible magnitude of change, then the impact is classified as of Low significance.
• Where a viewpoint of Medium or High sensitivity is subject to a negligible magnitude of change, then the impact is classified as of Low significance.

Finally, a statement is made as to the appropriateness of the proposed development in terms of its potential landscape and visual impact, based on the joint consideration of the landscape and visual amenity assessments.

7.3 Description of the Proposed Development

The key components of the proposed development are discussed below in terms of their potential landscape and visual impact.

7.3.1 Uses

The development initially proposed a mixed use proposal comprising three main elements:

- Retail
- Residential
- Amenity

The proposed retail development whilst considered here initially proposed a development [4]consisting of a supermarket with a gross floor area of 4,800sq.m and two anchor comparison units of 7,000sq.m each, a further 39no additional units are also proposed ranging in size from 79sq.m to 1,295sq.m amounting to a total of 12,081sq.m gross floor area for these units. In total there is 30,881sq.m gross floor area of retail floor space proposed. In addition there is a foodcourt of 3,496sq.m proposed comprising 8no individual units ranging in size from 96sq.m to 275sq.m. The application for the retail component also included 1,862 car parking spaces at basement and surface level.

In total the lands are capable of providing c. 1500 residential units, however the first phase of development provides for 353 units. In addition as part of phase 1, it is proposed to provide a neighbourhood centre which will include; shop / newsagents (417sqm gross), retail unit (78sqm gross), coffee shop (113sqm gross), pharmacy (78sqm gross), video store (95sqm gross) and doctor / dentist office (112sqm gross) and a creche facility.

The amenity and recreation lands at Greenpark include a range of passive and active recreation opportunities. The formal recreation facilities at Greenpark includes four tennis courts, one full size soccer pitch and ten five a side pitches. Passive recreation features include open grassy spaces for informal recreation, woodland and riverside walks and viewing/lookout points. The main spatial features of the site are avenue tree planting, woodland planting, feature mounding and the attenuation lagoon. Formal avenue tree planting frames main access routes and provides a clear structure defining different areas of use within the amenity lands. The attenuation lagoon is a focal point on the site. It draws the wetland environment into Greenpark providing opportunities for a more intimate relationship with the water. Some of the spoil from the excavation of the attenuation areas is used to create earth mounds and rolling topography on the site enclosing and sheltering the lagoon

7.3.2 Form

The development is divided by main roads into three geographical areas of activity; retail (an application for which is now withdrawn and revised proposals yet to be prepared or formulated), residential and amenity.

The amenity area is nestled between a loop in the Ballynaclogh River and the proposed main road running through the site connecting to the Dock road. It is linked to both the retail and residential sections of the development by pedestrian walkways running along common axes. Structure planting of formal avenues creates a number of spaces for potential activities through the main body of the area, whilst a more informal naturalistic approach is adopted adjacent to the Ballynaclogh river.

The residential section is laid out around a central circulation road that echoes the line of the old racetrack. A pedestrian friendly network of streets has been created linking a hierarchy of public open spaces spread throughout the scheme.

[4] The application for which is now withdrawn

7.3.3 Design and materials

Buildings

The design of the development would be of a contemporary style with a varied palette of materials, treatments and finishes. Architectural design has been developed in conjunction with landscape design to create a hierarchy of functional public spaces throughout the development and particularly within the residential element.

Landscape

The main objective of the landscape design is to provide a cohesive and ordered landscape framework in which future development will rest. The landscape will have the overall effect of integrating new built development visually and spatially into the existing open landscape by imposing a new framework of vegetation. A range of landscape spaces and characters will provide an environment that is legible and caters for a broad spectrum of use and experience.

The site is adjacent to the Ballynaclogh River, a rich ecological feature designated as an SAC (Special Area of Conservation). The landscape masterplan aims to build on the ecological value of the Ballynaclogh River by extending native and naturalised planting regimes into the Greenpark site.

Residential

The layout for the residential area refers to existing features on the site namely the race course. A loop access route echoing the shape of the race course passes through the residential area and is highlighted by formal avenue tree planting. A hierarchy of open spaces with differing characters and potential uses are scattered along the route, they include children's play facilities, paved plaza areas and grassy spaces for informal recreation. Higher density housing is equipped with private paved courtyard spaces softened by trees and shrubs in planters.

A pedestrian crossing over the highway links the residential area with the regional amenity and formal paved pedestrian routes link with the retail facilities providing convenient access to the other features on the site. Avenue tree planting and feature paving highlights the access routes. Throughout the residential area several secondary pedestrian links provide a convenient and safe pedestrian network encouraging a lively streetscape for The Greenpark Development.

Amenity

The amenity and recreation lands at Greenpark include a range of passive and active recreation opportunities. The formal recreation facilities include four tennis courts, one full size soccer pitch and ten five a side pitches. Passive recreation features include open grassy spaces for informal recreation, woodland and riverside walks and viewing/lookout points.

The main spatial features of the site are avenue tree planting, woodland planting, feature mounding and the attenuation lagoon. Formal avenue tree planting frames main access routes and provides a clear structure defining different areas of use within the amenity lands. The attenuation lagoon is a focal point on the site. It draws the wetland environment into Greenpark providing opportunities for a more intimate relationship with the water. Some of the spoil from the excavation of the attenuation areas is used to create earth mounds and rolling topography on the site enclosing and sheltering the lagoon.

The south bank of the lagoon in the amenity area abuts the SAC (Special Area of Conservation) / Ballynaclogh River. It is proposed that this area be natural in character with supplemental planting of approved native species enhancing the ecological value. The planting associated with the attenuation lagoon will also maintain and seek to enhance the ecological diversity on the site. The landscape design has been carefully developed in tandem

with an ecologist's advice to ensure that native flora and fauna are not adversely affected by the proposed development but actually prosper from it.

Woodland planting divides the amenity area into smaller more manageable portions whilst acting as windbreaks and acoustic buffers from highway traffic. Woodland will not only create useful micro-climates for sporting and passive recreation activities, but also add visual interest and create additional habitat.

7.4 RECEIVING ENVIRONMENT

Figure 7.1 Key Elements of the Receiving Environment.

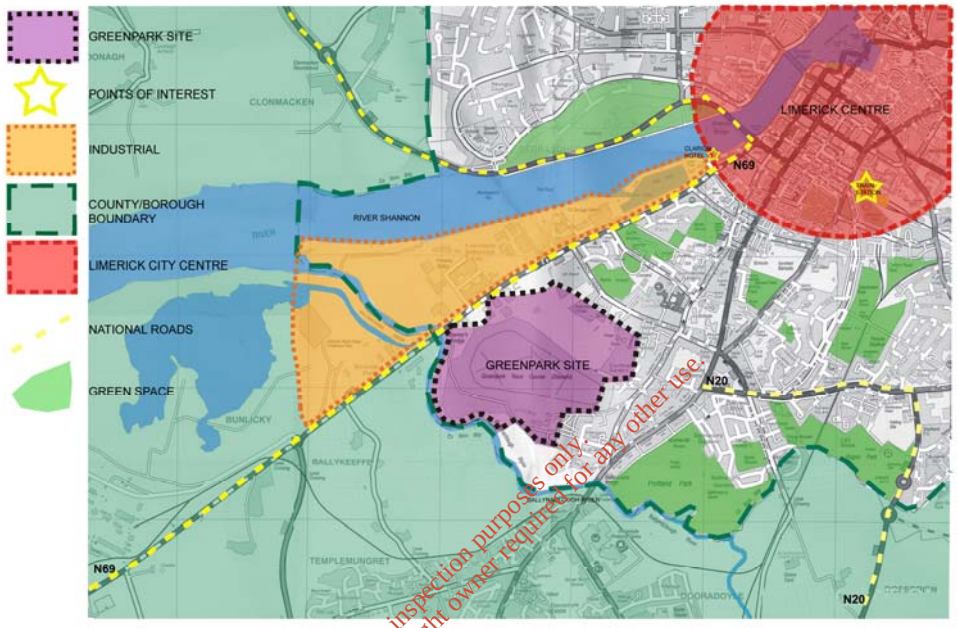
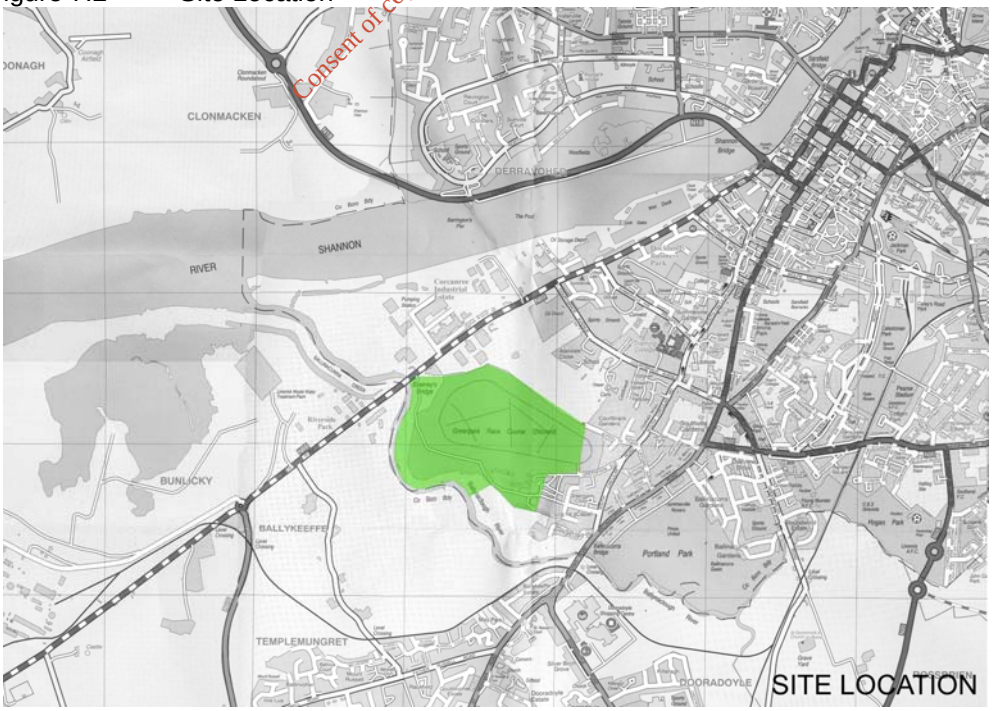


Figure 7.2 Site Location



The proposed development site, 48ha of greenfield lands previously part of the Limerick Racecourse, is located 1.5km southwest of Limerick city centre and is accessed off the Dock Road south of the Corcanree Industrial estate.

The site, formerly a racecourse and ancillary lands, currently exists as unused open space. Due to lack of development or ongoing maintenance it has become untidy in appearance.

The immediate receiving environment

The River Shannon lies approximately 0.5km north of the site and flows in a westerly direction parallel to the Dock road, dividing the northern side of the city from the southern side where the site is situated. A variety of industrial premises are located between the river and the site; including a waste water treatment plant, industrial estate and oil storage depot amongst others typical of a dockland environment.

The western to south-western edge of the site is bound by the Ballynaclough River, beyond which lies undeveloped agricultural land, primarily pasture.

A number of private residential developments of primarily low density, detached and semi-detached suburban housing typify the environment to the south and south east of the site. These are accessed off St Nessan's and the South Circular roads which continue on directly into the heart of the city. The Dooradoyle Road and the Childers roads, (connecting to the N20 and the Southern Ring road respectively - important local and regional transport linkages), link directly into these arteries less than 0.5km from the site.

Private residential development again of primarily low density, detached and semi-detached suburban housing continues around the site in an easterly and north easterly direction accessed off Courtbrack Avenue which links back onto the Dock road at a point to the north of the site beside an Oil depot.

In summary, three major land use types surround the site, all with distinctive landscape patterns; form the local landscape character areas or elements surrounding the site:

- Industrial

The area between the Dock road and the River Shannon is characterised by light industrial development. The road frontage itself has assumed a pattern of strip development, typified by uses such as car dealerships, building providers and petrol filling stations. Behind the road frontage 'heavier' industries front onto the Shannon, typified by oil storage depots, a waste water treatment plant and cement works. The collective visual and landscape impact is that of a rather eclectic mix of industrial units, accessed by private side roads off the Dock road, surrounded by ancillary open spaces and car parking.

- Residential

Extending from the south east of the site to the northeast is an extensive higher-lying area of detached and semi-detached two-storey housing in large private gardens, mostly fronting cul-de-sac access roads. Land use and the landscape pattern is as a consequence relatively homogenous. The private gardens and streets are generally well-vegetated, affording a high degree of privacy and enclosure to residents.

Portland Park, a public open space of city wide significance offering parkland walks and sports pitches is situated less than 0.5km from the site to the south east beyond the Ballincurra Road.

- Agricultural

The area of land southwest of the site represents the edge of the cities expansion. Undeveloped agricultural pastureland land sits on an elevated position overlooking the Shannon and the city between the Ballynaclough River, (which demarcates the city/county

boundary), and the Templemungret / Gouldavoher localities, (which although in the County have effectively become a linked part of the city through the outward creeping of development over the years).

The Broader Receiving Environment

Limerick city centre lies 1.5km northeast of the site, between which a variety of typical edge of town land uses and developments occur; including commercial, office, hotel, retail and residential.

North of the site beyond the Shannon a wetland area of special conservation stretches between Barrington's Pier and the Shannon Bridge known as Westfields. This area has a circuitous pedestrian walkway and serves as an important recreational amenity as well as an area of ecological value. Beyond to the north the landuse is typically low to medium density suburbs interspersed with institutional lands and open space / recreational grounds stretching to the northern edge of the city.

To the northwest of the Shannon the land is composed of low lying floodplains that are primarily used for agricultural land though a small number of residential properties also occur and a small airfield, (Coonagh Airfield), is also located here.

2km west of the site is the cement factory which forms a local landmark and Mungret village, beyond these the landscape is primarily agricultural.

Less than 1km south of the site is located the Dooradoyle Shopping Centre and 0.5km further south are the Limerick Regional Hospital and Crescent College. These institutional and commercial landmarks are surrounded by an expanse of low density suburbs interspersed with institutional lands and open space / recreational grounds stretching to the Raheen Industrial estate on the city's south-western edge.

The landscape east of the site is characterized by low to medium density housing estates, interspersed with a significant band of public open space that stretches from Portland Park, to Hogan Park to Rathbane golf course. These are bound by the newly constructed southern relief road.

The N69 (Dock road) is the main access road to the site and also a main arterial route from Limerick city centre outwards and leads to Tralee. It also links a significant amount of southbound traffic onto the N20 towards Cork. Traffic from the south wishing to pass through Limerick in order to cross the river Shannon on their way to Shannon Airport or Galway is also channelled via the Dock road to cross the Shannon bridge.

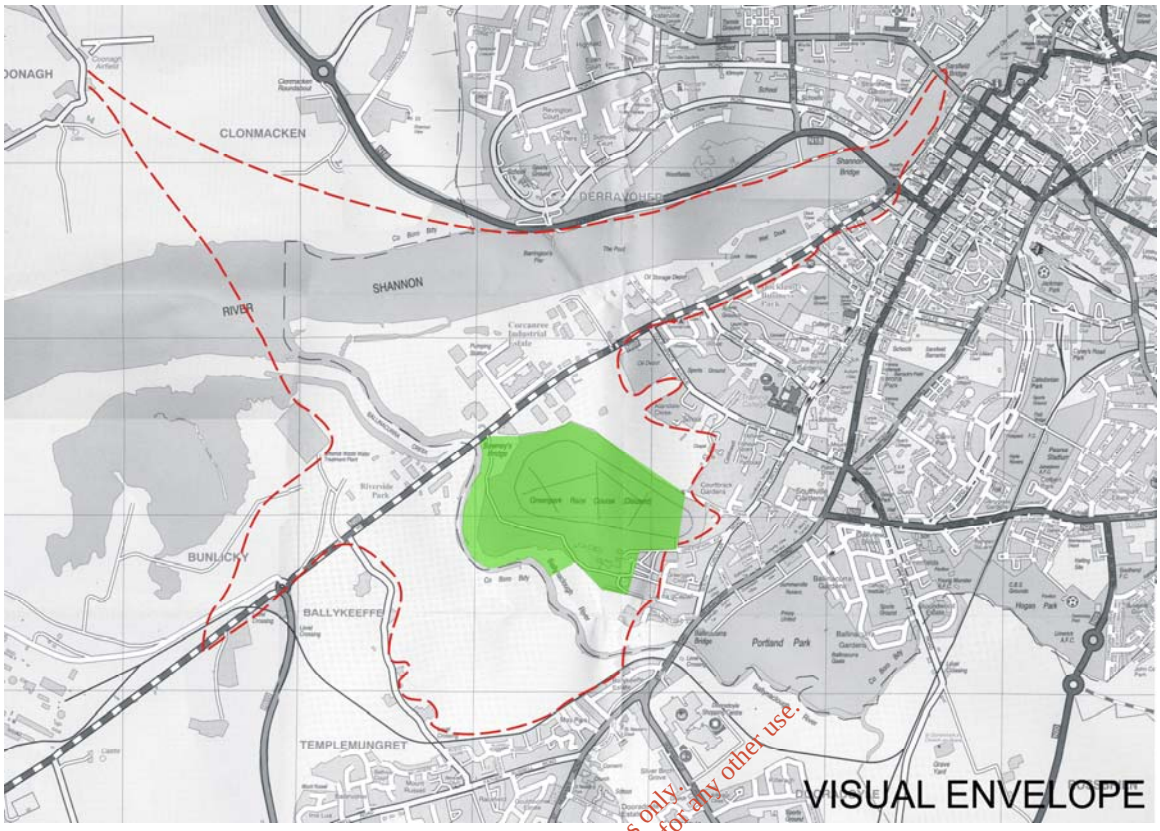
Landscape and visual impact assessment is essentially concerned with two things:

1. the changes as a result of the development that affect the fabric, character, values and quality of the landscape as identified above and
2. visual changes that affect the views (and viewers) within a landscape

Landscape and visual impacts do not necessarily coincide and more importantly, their significance may not be related.

In order to assess these, seventeen different viewpoints have been chosen to represent the limits of the visual envelope, are individually examined in this section.

Figure 7.3 Visual envelope map



The degree of visual intrusion the development has also affects the receiving environment, this is illustrated through a visual envelope map (VEM).

The map attempts to approximately represent the area of the anticipated visual envelope. It should be appreciated that VEM's cannot be completely accurate, due to the complexities of the surrounding built environment and access issues encountered during the surveys. It is possible therefore that some glimpses, (particularly of the upper levels of the development), may occasionally be experienced beyond this envelope - from upper storey windows of private residences for example. It is likely any such views will be medium to long range in nature, and as such tempered by the surrounding built environment.

As implied from the above map, the visual envelope is limited by several different factors:

The built environment of Limerick city largely defines the VEM's boundaries to the east. This continues round to the south before field boundary vegetation and landform combine to define the limits to the west.

North of the site the visual envelope extends beyond the river Shannon. Existing vegetation limits the boundary on the far side of the river to a large extent however more open land to the north west allow the envelope to extend further. Existing field boundary vegetation which runs along the roadsides serves to define the envelope in this direction.

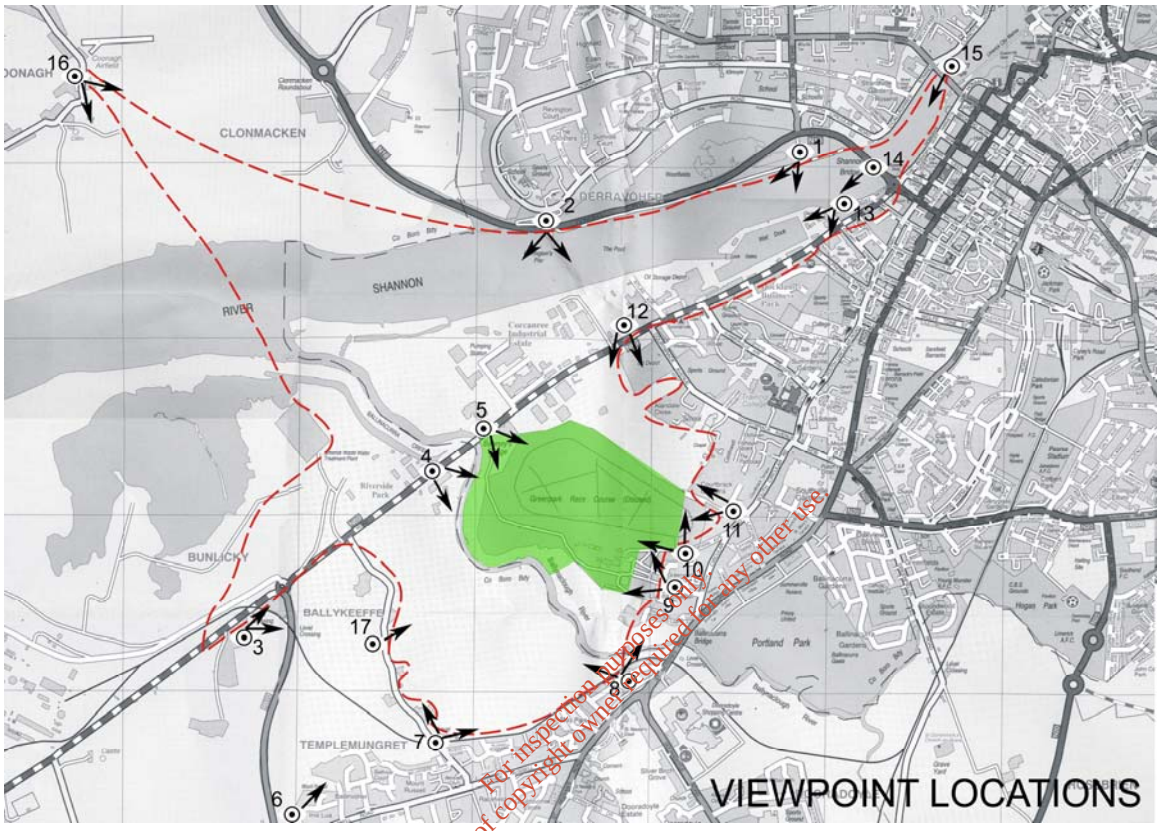
Views of the site from some areas on the outer limits of the visual envelope will be limited to glimpses of upper levels of the proposed development.

Location of Viewpoints for Visual Impact Assessment

Based on the assessment of the landscape and the identification of key elements and characteristics of the receiving environment, seventeen viewpoints were selected for assessment of visual amenity impact. These viewpoints were selected to represent the limits of the visual envelope.

The potential visual impact on each viewpoint is assessed below, based on the degree / quantity of change to the field of view (towards the site) which would result from the proposed development and the sensitivity of the visual receptors at that location. For each viewpoint the field of view towards the Site is described in terms of its key elements or characteristics and illustrated with annotated photographs.

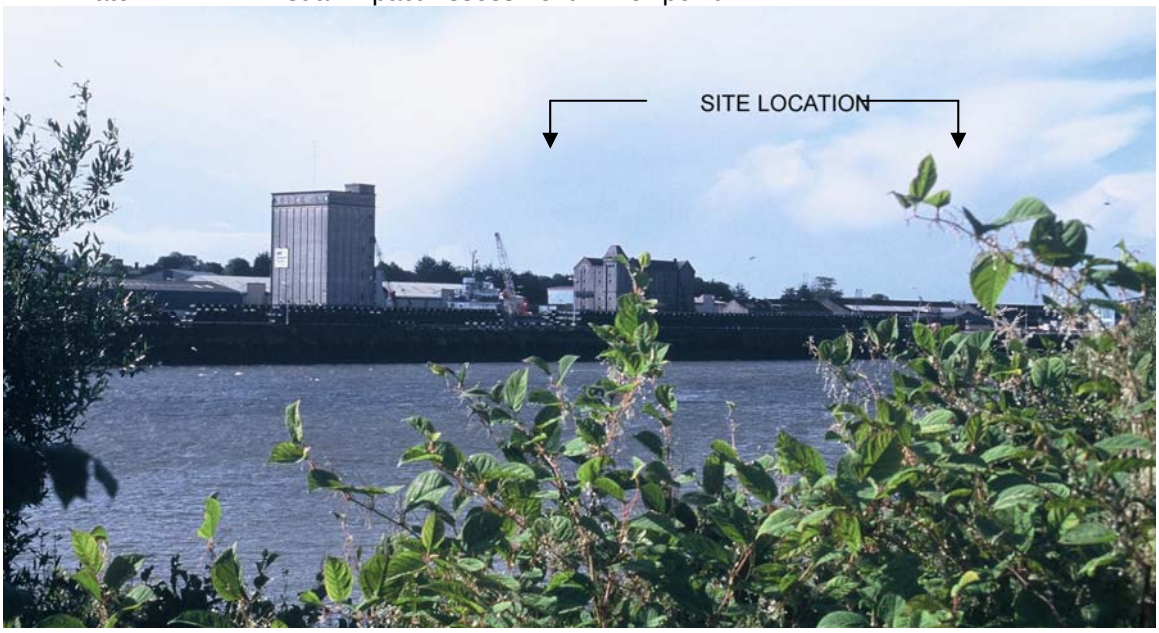
Figure 7.4 Viewpoint location map



No.	Location / Description	Distance from Site
V1	Riverside Walkway - Westfields	1.5km
V2	Barrington's Pier	0.9km
V3	N69 near Level Crossing	1.5km
V4	N69 at Riverside Park	0.4km
V5	Bawney's Bridge	0.2km
V6	Inis Lua / Father Russell Road	2km
V7	Level Crossing	1km
V8	Ballykeefe Estate	0.4km
V9	Lug Na gCapall	0.1km
V10	Greenpark Avenue	0.1km
V11	Boreen Na Tobar	0.1km
V12	Dock Road / Courtbrack Ave	0.6km
V13	Dock Road / O' Curry Street	1.4km
V14	Shannon Bridge	1.5km
V15	Sarsfield Bridge	2.1km
V16	Coonagh Airfield	3km
V17	Ballykeefe / Tempemungret	1km

Viewpoint 1 Riverside walkway – Westfields (Distance from site approx 1.5km)

Plate 7.1 Visual Impact Assessment – Viewpoint 1



Description of existing view

The view towards the site is dominated by the wide expanse of the River Shannon and the industrial buildings arranged around the wet dock located on its southern bank. Views towards the site from the walkway are intermittent due to existing vegetation on the rivers northern bank. Views beyond the southern bank are limited due to the height of existing development, however the tops of tree canopies emerging from the residential and open space areas south of the Dock Road. The views are distinctly industrial in nature, characterized by dockside activities.

Magnitude of Change

The magnitude of change to this viewpoint resulting from the proposed development would be Negligible:

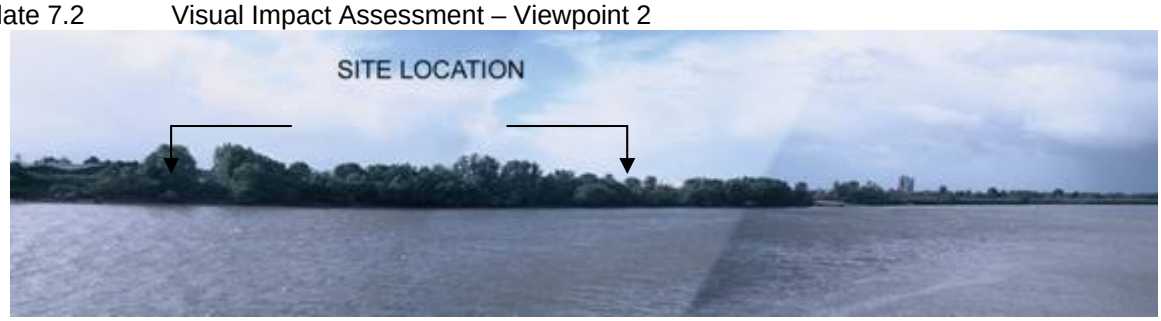
The views towards the site are already distinctly industrial in scale and character. As a direct consequence of their scale, views beyond them are limited, with only the tops of trees and glimpses of buildings roofs being visible. Given the distance of the proposed development and its height, it is likely that only glimpses of its upper levels might be visible – causing minor alteration through the introduction of elements that are not uncharacteristic in the views context. Relative distance would also lessen any potential visual impact.

Viewpoint Sensitivity

The sensitivity of the visual receptors at these viewpoints is High: as users of the riverside walkway recreational facility will be walking or jogging, their attention will be largely focused on the landscape.

Viewpoint 2 Barrington's Pier (Distance from site approximately 0.9km)

Plate 7.2 Visual Impact Assessment – Viewpoint 2



Description of existing view

A key characteristic of the viewpoint is its exposed position on the end of a pier stretching out into the Shannon. This location affords a broad panoramic view across the river. The site is located directly south of the pier.

If it were not for the very dense mature vegetation located on the opposite bank of the river the Corcanree Industrial Estate would be highly visible fronting onto the river, however only glimpses are seen between the vegetation. Directly behind the industrial estate on the far side of the Dock Road lies the site.

The cement works can be seen to the west of the site (far right of photo), and the Water treatment plant can also be seen between it and the site location.

Magnitude of Change

The magnitude of change to this viewpoint resulting from the proposed development would be Negligible:

No element or feature of the view would be lost since all of the vegetation between the viewpoint and the site will continue to act as a screen, although the introduction of the proposed buildings would be in line with the character with the landscape. It is possible that glimpses of the developments upper levels may be seen over the tree line, however any such views would be minor.

Viewpoint Sensitivity

The sensitivity of the visual receptors at this viewpoint is High: as users of the riverside walkway recreational facility will be largely use the pier as a destination and viewing point upon arrival, consequently their attention will be largely focused on the landscape.

Viewpoint 3 N69 near Level Crossing (Distance from site approx 1.5km)

Plate 7.3 Visual Impact Assessment – Viewpoint 3

Description of View

The N69 creates a linear corridor from which views open up towards the site. This location marks the limit of such views. Existing roadside development, (primarily light industrial), and existing vegetation serve to screen views towards the site on an intermittent basis, they also characterize the immediate vicinity.

Existing mature trees screen much of the development further along the Dock Road towards the site, however it is likely that filtered views will become apparent after autumn leaf fall. An industrial silo building can also be clearly seen located off the R510.

Magnitude of Change

The magnitude of change to the viewpoint resulting from the proposed development would be Negligible:

The proposed development is likely to cause only a very minor alteration to the view due to the possible introduction of elements of the buildings into the view. Ground level development will be screened from view by existing vegetation and other elements, whilst it is probable that only glimpses of the tallest buildings upper level will be seen.

Viewpoint Sensitivity

The sensitivity of the visual receptors at this viewpoint is Medium: people will travel through or past the affected landscape in cars or on public transport, viewing but not focused on the landscape.

Viewpoint 4 N69 at Riverside Park (Distance from site approx 0.4km)

Plate 7.4 Visual Impact Assessment – Viewpoint 4

Description of View

The key characteristic of the viewpoint is its dominance by road traffic and strip development along both sides of the Dock Road. To the right of picture a series of outlet units, (Riverside Park), are located behind an expanse of car parking, there is no landscaping to mitigate views. Signage is also a prominent feature along both sides of the road. The distinctive sloping roof of a tall existing industrial structure close to the site can be behind signage for Riverside Park, whilst the top of the Clarion hotel can be seen in the distance above the trees.

Views towards the site are partially blocked by existing vegetation and built form.

Magnitude of Change

The magnitude of change to this viewpoint would be Medium:

It is likely that significant portions, particularly upper storeys of any retail portion of the development (which may be submitted and subject to future planning applications) would be prominent from this viewpoint, however they are unlikely to be substantially uncharacteristic in the context of the view.

Viewpoint Sensitivity

The sensitivity of the visual receptors at this viewpoint is Medium: people will travel through or past the affected landscape in cars or on public transport, viewing but not focused on the landscape.

Viewpoint 5 Bawney's Bridge (Distance from site approx 0.2km)

Plate 7.5 Visual Impact Assessment – Viewpoint 5

Description of View

Bawney's bridge crosses the Ballynaclough River which runs along the sites western boundary. Views from the bridge stretch down the open expanse of the Dock road towards the city centre. At the far end of the Dock Road the Clarion hotel can clearly be seen, whilst the Roches grain silo can be seen in the foreground. Between these two buildings a number of light industrial units are situated. The site forms an open Greenfield expanse to the south of the road and the far side of the river.

Magnitude of Change

The magnitude of change from this viewpoint within the residential suburbs to the west of the Site would be High:

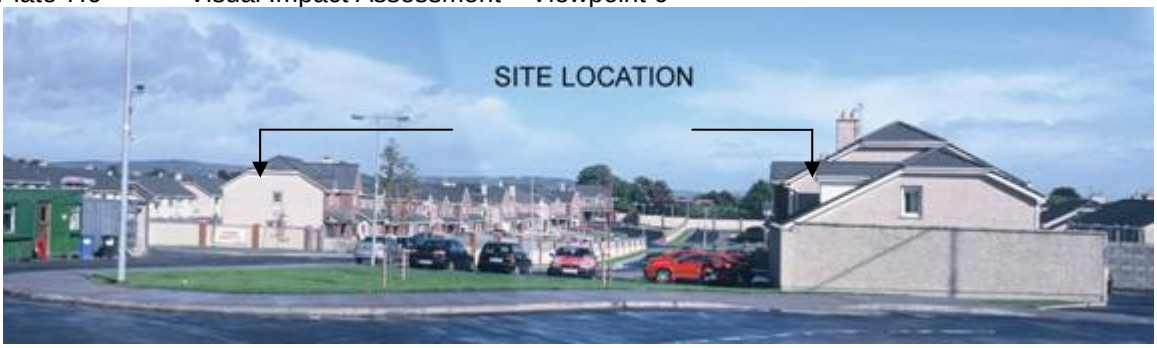
Whilst the precedent of roadside strip development is already well established, the greenfield element of the view would be lost or radically altered.

Viewpoint Sensitivity

The sensitivity of the visual receptors at this viewpoint is Medium: people will travel through or past the affected landscape in cars or on public transport, viewing but not focused on the landscape.

Viewpoint 6 Inis Lua / Father Russell Road (Distance from site approx 2km)

Plate 7.6 Visual Impact Assessment – Viewpoint 6



Description of View

The key characteristic of views from this location is the homogenous suburban character of the surrounding landscape, from foreground to middle distance. The only views of note from street level are over the rooftops towards the hills north of the city. It is possible however that some upper windows of houses within the estate will have oblique views of the agricultural land which lies between the estate and the site.

Magnitude of Change

The magnitude of change to these viewpoints resulting from the proposed development would be Negligible:

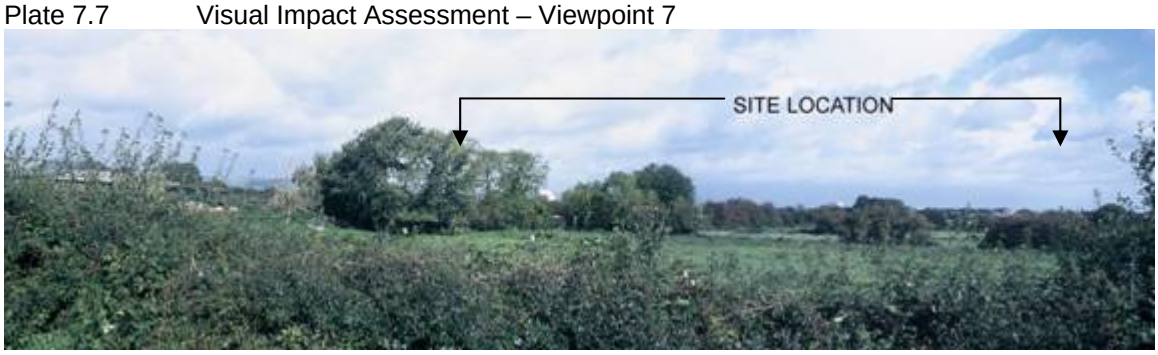
Higher elements of the development could possibly partially be visible between house rooftops or from upper storey windows, however it is unlikely that any visual intrusion of significance will occur from this location.

Viewpoint Sensitivity

The sensitivity of the visual receptors at these viewpoints is High: as occupiers of residential properties.

Viewpoint 7 Level Crossing (Distance from site approx 1km)

Plate 7.7 Visual Impact Assessment – Viewpoint 7



Description of View

The key characteristics of views from the level crossing are the agricultural pastureland and the mature hedgerow vegetation within it. Glimpses of existing built form including the Roches grain silo can be seen above the tree canopies in the distance. The hills to the north of the city can be seen to the left of picture.

Magnitude of Change

The magnitude of change to these viewpoints resulting from the proposed development would be Negligible:

There would be no loss or alteration of any of the key elements or characteristics of the view, any protruding elements of the upper levels of any proposed buildings are unlikely to be greater in significance than those already seen in the view and would consequently be a minor change and not out of character.

Viewpoint Sensitivity

The sensitivity of the visual receptors at these viewpoints is High: due to a number of residential properties in the locality.

Viewpoint 8 Ballykeeffe Estate (Distance from site approx 0.4km)

Plate 7.8 Visual Impact Assessment – Viewpoint 8

Description of View

The key characteristics of views from the Ballykeeffe Estate are the agricultural pastureland and the mature hedgerow vegetation within it which lies between the housing and the site. Glimpses of existing built form including the Roches grain silo can be seen above and between the tree canopies in the distance.

Magnitude of Change

The magnitude of change to these viewpoints resulting from the proposed development would be Negligible:

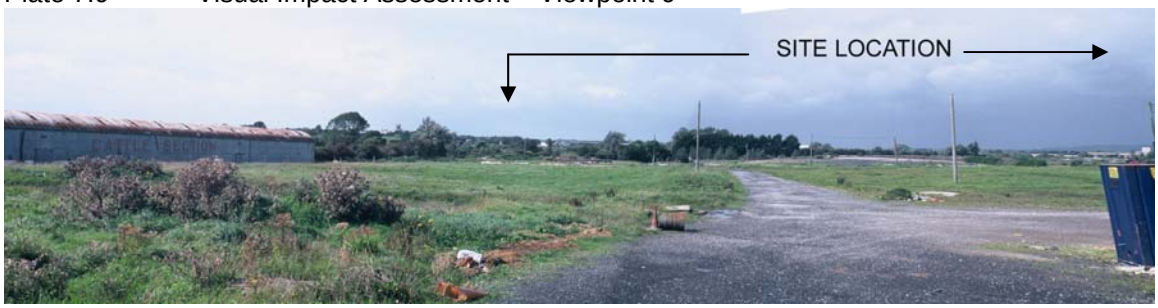
There would be no loss or alteration of any of the key elements or characteristics of the view, any protruding elements of the upper levels of any proposed buildings are unlikely to be greater in significance than those already seen in the view and would consequently be a minor change and not out of character.

Viewpoint Sensitivity

The sensitivity of the visual receptors at these viewpoints is High: due to a number of residential properties in the locality.

Viewpoint 9 Lug na gCapall (Distance from site approx 0.1km)

Plate 7.9 Visual Impact Assessment – Viewpoint 9



Description of View

This view is afforded by a laneway between existing development past which there is no public access and as such has a limited scope of view. It is noted that private residential development backing onto the site on either side will enjoy similar or more expansive views from upper storey windows. The view is derelict in nature.

A corrugated iron cattle shed and existing vegetation limit the view to the west in what is otherwise an expansive area of open ground. Internal vehicular circulation tracks and telegraph poles are the only other development in view on site, though a number of rooftops can be seen in the distance over existing trees on site. Beyond these the hills north of the city can be seen on the horizon.

Magnitude of Change

The magnitude of change to the viewpoint would be High:

Land use changes will be substantial and prominent in the context of the existing landscape, which currently has little or no development in terms of built form. The proposed development however is not considered substantially uncharacteristic in the context of the view as a whole with traces of development along the Dock Road visible in the distance behind existing vegetation.

Viewpoint Sensitivity

The sensitivity of the viewpoint is High: due to the number of residential properties in the vicinity. The sensitivity / vulnerability of the view lies in its potential to be screened in the foreground however, and less so in the potential for alteration or loss of the key elements of the view.

Viewpoint 10 Greenpark Ave (Distance from site approx 0.1km)

Plate 7.10 Visual Impact Assessment – Viewpoint 10

Description of View

The key characteristic of views from the Greenpark Avenue area is the open greenspace of the former racecourse lands. Some vegetation exists around the periphery of the site with glimpses of existing built form including the Roches grain silo visible above and between the tree canopies in the distance.

Magnitude of Change

The magnitude of change to these viewpoints resulting from the proposed development would be High:

Land use changes will be substantial and prominent in the context of the existing landscape, which currently has little or no development in terms of built form. Most existing views will be entirely dominated by the new development proposals.

Viewpoint Sensitivity

The sensitivity of the visual receptors at these viewpoints is High: due to a number of residential properties in the locality. The sensitivity / vulnerability of the view lies in its potential to be screened in the foreground however, and less so in the potential for alteration or loss of the key elements of the view.

Viewpoint 11 Boreen Na Tobar (Distance from site approx 0.1km)

Plate 7.11 Visual Impact Assessment – Viewpoint 11

Description of View

The key characteristic of views from the Boreen Na Tobar area is the open greenspace of the former racecourse lands. This open space is met on its western boundary by the Ballynaclough river which is hidden by the landform and large belts of existing vegetation. Beyond this agricultural pastureland can be seen. In the distance the cement works can be seen above the tree line.

Magnitude of Change

The magnitude of change to these viewpoints resulting from the proposed development would be High:

Land use changes will be substantial and prominent in the context of the existing landscape, which currently has little or no development in terms of built form. A large proportion of the existing views will be completely dominated by the new development proposals.

Viewpoint Sensitivity

The sensitivity of the visual receptors at these viewpoints is High: due to a number of residential properties in the locality. The sensitivity / vulnerability of the view lies in its potential to be screened in the foreground however, and less so in the potential for alteration or loss of the key elements of the view.

Viewpoint 12 Dock Rd / Courtbrack Ave (Distance from site approx 0.6km)

Plate 7.12 Visual Impact Assessment – Viewpoint 12

Description of View

Views from the Dock Rd / Courtbrack Ave junction look towards the site over an oil depot, two of the storage tanks of which are prominent in the view. Existing concrete boundary walls and mature trees screen a large proportion of the view. Vehicular traffic dominates the foreground as traffic travels towards the city along the Dock road.

Magnitude of Change

The magnitude of change from this viewpoint would be Negligible:

With only minor alteration to the view through possible loss of views of open sky due to the upper elements of the proposed development breaching the skyline in places. Any such views would not be uncharacteristic in the context of the view.

Viewpoint Sensitivity

The sensitivity of the visual receptors at this viewpoint is Medium: people will travel through or past the affected landscape in cars or on public transport, viewing but not focused on the landscape.

Viewpoint 13 Dock Rd / O' Curry St (Distance from site approx 1.4km)

Plate 7.13 Visual Impact Assessment – Viewpoint 13

Description of View

Views from the Dock Rd / Curry Street junction look towards the site over a gas works in the immediate foreground. Existing high boundary walls and adjoining roadside development entirely screen views towards the site. Vehicular traffic dominates the environment as traffic travels to and fro the city along the Dock road.

Magnitude of Change

The magnitude of change from this viewpoint would be Negligible:

Very minor alteration to the view, if any, will occur through possible loss of views of open sky due to the upper elements of the proposed development breaching the skyline in places. Any such views would not be uncharacteristic in the context of the view.

Viewpoint Sensitivity

The sensitivity of the visual receptors at this viewpoint is Medium: people will travel through or past the affected landscape in cars or on public transport, viewing but not focused on the landscape.

Viewpoint 14 Shannon Bridge (Distance from site approx 1.5km)

Plate 7.14 Visual Impact Assessment – Viewpoint 14

Description of View

Views from the Shannon Bridge look towards the site over a gas works in the immediate foreground. Existing high boundary walls and adjoining roadside development entirely screen views towards the site. Vehicular traffic dominates the environment as traffic travels to and fro the city along the Dock road.

Magnitude of Change

The magnitude of change from this viewpoint would be Negligible:

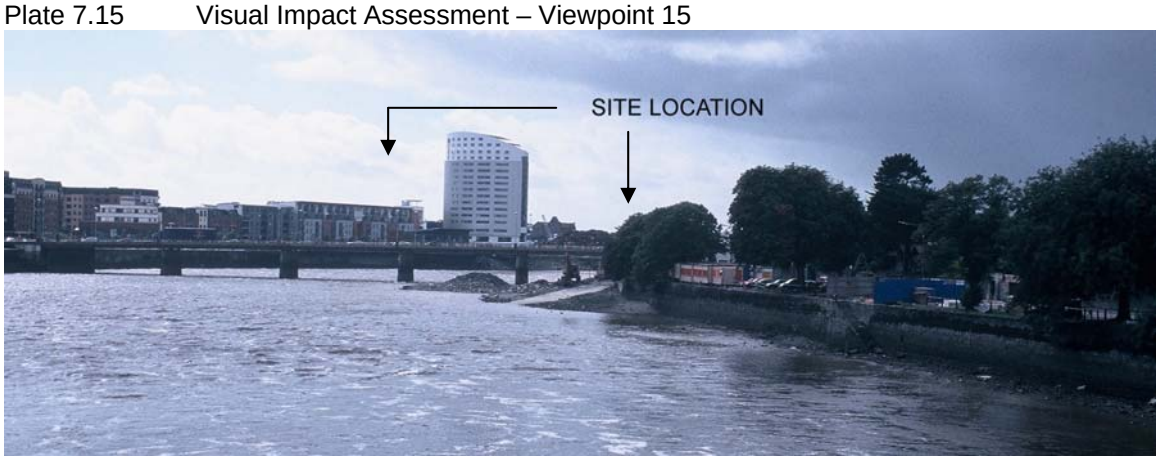
Very minor alteration to the view, if any, will occur through possible loss of views of open sky due to the upper elements of the proposed development breaching the skyline in places. Any such views would not be uncharacteristic in the context of the view.

Viewpoint Sensitivity

The sensitivity of the visual receptors at this viewpoint is High: as although typically people who travel through or past a landscape in cars or on public transport, will be viewing but not focused on the landscape, in this case people will avail of the open views along the Shannon from the bridge.

Viewpoint 15 Sarsfield Bridge (Distance from site approx 2.1 km)

Plate 7.15 Visual Impact Assessment – Viewpoint 15



Description of View

Views from the Sarsfield Bridge look towards the site over the river Shannon and the Shannon Bridge in the foreground. High rise waterfront development and the Clarion Hotel on the south bank dominate views beyond. Mature trees line the northern bank, behind which a road runs parallel with the river.

Magnitude of Change

The magnitude of change from this viewpoint would be Negligible:

Very minor alteration to the view, if any, will occur through possible loss of views of open sky due to the upper elements of the proposed development breaching the skyline in places. Any such views would not be uncharacteristic in the context of the view.

Viewpoint Sensitivity

The sensitivity of the visual receptors at this viewpoint is High: as although typically people who travel through or past a landscape in cars or on public transport, will be viewing but not focused on the landscape, in this case people will avail of the open views along the Shannon from the bridge.

Viewpoint 16 Coonagh Airfield (Distance from site approx 3 km)

Plate 7.16 Visual Impact Assessment – Viewpoint 16

Description of View

Views from the Coonagh Airfield look towards the site over the river Shannon and an expanse of floodplain. The view is open and expansive and is characterised by agricultural pastureland.

Magnitude of Change

The magnitude of change from this viewpoint would be Negligible:

Very minor alteration to the view, if any, will occur through possible glimpses of the upper elements of the proposed development breaching the treeline. Any such views would be very minor and will be further ameliorated by the long range nature of the view.

Viewpoint Sensitivity

The sensitivity of the visual receptors at this viewpoint is High: due to a number of residential dwellings located in the vicinity.

Viewpoint 17 Ballykeefe / Templemungret (Distance from site approx 1 km)

Plate 7.17 Visual Impact Assessment – Viewpoint 17

Description of View

The key characteristic of views from this location is the rural nature of the pastureland set against the development of Limerick City seen on the horizon. Several buildings puncture the skyline including among others the Clarion Hotel, a church steeple and Roches grain silo.

Magnitude of Change

The magnitude of change to these viewpoints resulting from the proposed development would be Low:

Partial alteration to the skyline will be an inevitable consequence of the proposed development however in the context of the view this is not uncharacteristic.

Viewpoint Sensitivity

The sensitivity of this viewpoint is High: due to a number of residential properties in the locality. The sensitivity / vulnerability of the view lies in its potential to be screened in the foreground however, and less so in the potential for alteration or loss of the key elements of the view.

7.5 Conclusions

7.5.1 'Do Nothing' Scenario

The 'do nothing' scenario implies the retention of the site as open space rather than allowing development, as proposed or otherwise. Open space in the urban environment should perform a number of functions. It should provide visual and recreational amenity, and should contribute to the ecological integrity / biodiversity of the environment.

The functional value of the Site in its current condition is limited. It does provide a degree of visual amenity to the surrounding environment; its open greenspace in particular is widely visible from the surrounding landscape and is an important element of numerous views throughout the receiving environment. To a small number of nearby dwellings in particular, the open space inherent in the Site's condition of disuse is valuable in terms of visual amenity. However, being private property and inaccessible to the public the site's recreational value as an open space is limited.

In terms of ecological / biodiversity value, the quality of the area has been diminished by its previous uses and the presence of pioneer species plants common to waste ground the result of mans disturbance in the recent past. Without intervention in the form of the removal of the inappropriate invasive species and new planting of native species it is likely that the integrity of this landscape feature will be further compromised through invasive weed species and litter. This will eventually impact adversely upon the SAC that runs adjacent to the site along the Ballynaclogh River.

7.5.2 Ameliorative, Remedial or Reductive Measures

Soft Open Space

It is proposed to develop a significant portion of the overall site area as amenity open space, to which belts of woodland planting are an integral element. Additionally, formal avenue tree planting will occur throughout this area. This planting will mature to create both effective visual screens and filters. Similar structure tree planting has also been incorporated throughout the public open spaces incorporated in the residential development areas.

Hard Open Space

Formal tree planting along the streetscapes and urban plazas of both the retail and residential portions of the development will serve to soften the visual impact of surrounding built form

7.6 Predicted Impact of the Proposal

1. Landscape Impact

Landscape impact is predicted based on the likely nature and scale of changes to individual landscape elements and characteristics (and the consequential effect on landscape character) and the sensitivity of the landscape resource. Existing trends of change in the landscape are taken into account.

The sensitivity of the landscape resource is a function of its land use, landscape patterns and scale, visual enclosure and distribution of visual receptors and the value placed on the landscape. The sensitivity of the landscape resource (the receiving environment) in this case has been classified as medium: It exhibits a generally positive character but has evidence of ongoing alteration and some degradation to its key elements and characteristics (including land use, landscape patterns and scale, and visual enclosure). The combination of new features, (generally light industrial developments), alongside the open space of the former racecourse has resulted in a locality of mixed character. It is therefore potentially sensitive to

landscape change but can accommodate alteration that positively reinforces its emerging mixed use character.

The scale or magnitude of landscape effects (or the quantity of change) which would be imposed on the landscape as a result of the proposed development is classified as medium: approximately two thirds of the site, would be replaced by new and prominent landscape elements (the proposed residential and commercial buildings), whilst the third closer to the Ballynaclough river would be retained and notably enhanced as amenity open space. This will result in the partial loss of or alteration to one key element of the receiving environment, i.e. the undeveloped open space, and the introduction of built form and ancillary development that may be prominent but are not however considered to be substantially uncharacteristic in the context of the receiving environment.

In conclusion, the proposed change in land use viewed in tandem with the pattern and scale of the development components, it is considered are appropriate to the sites location and character.

The significance of the predicted landscape impact is therefore considered to be Medium, and it is proposed, Beneficial to the receiving environment.

2. Visual Amenity

The predicted visual impact on each of the seventeen viewpoints, selected to represent the receiving environment, is based on the degree / quantity of change to the field of view (towards the site) which would result from the proposed development and the sensitivity of the visual receptors at that location.

View No.	Location	Distance from Site	Degree of Change	Viewpoint Sensitivity	Classification of impact	Predicted Short term Impact	Predicted Long term Impact
V1	Riverside walkway - Westfields	1.5km	Negligible	High	**Neutral**	**LOW**	**LOW**
V2	Barrington's Pier	0.9km	Negligible	High	**Neutral**	**LOW**	**LOW**
V3	N69 Near Level Crossing	1.5km	Negligible	Medium	**Neutral**	**LOW**	**LOW**
V4	N69 at Riverside Park	0.4km	Medium	Medium	**Positive**	**MEDIUM +**	**MEDIUM +**
V5	Bawney's Bridge	0.2km	High	Medium	**Positive**	**HIGH +**	**HIGH +**
V6	Inis Lua / Father Russell Road	2km	Negligible	High	**Neutral**	**LOW**	**LOW**
V7	Level Crossing	1km	Negligible	High	**Neutral**	**LOW**	**LOW**
V8	Ballykeefe Estate	0.4km	Negligible	High	**Positive**	**LOW +**	**LOW +**
V9	Lug Na gCapall	0.1km	High	High	**Adverse**	**HIGH -**	**MEDIUM -**
V10	Greenpark Ave	0.1km	High	High	**Adverse**	**HIGH -**	**MEDIUM -**
V11	Boreen Na Tobar	0.1km	High	High	**Adverse**	**HIGH -**	**MEDIUM -**
V12	Dock Rd / Courtbrack Ave	0.6km	Negligible	Medium	**Neutral**	**LOW**	**LOW**
V13	Dock Rd / O' Curry Street	1.4km	Negligible	Medium	**Neutral**	**LOW**	**LOW**
V14	Shannon Bridge	1.6km	Negligible	High	**Neutral**	**LOW**	**LOW**
V15	Sarsfield Bridge	2.1km	Negligible	High	**Neutral**	**LOW**	**LOW**
V16	Coonagh Airfield	3km	Negligible	High	**Neutral**	**LOW**	**LOW**
V17	Ballykeefe / Templemungret	1km	Low	High	**Adverse**	**MEDIUM -**	**LOW -**

7.7 Landscape and Visual Impact Assessment Conclusion

It is inevitable that there will be significant visual impacts associated with any large-scale development of the nature proposed here. The pertinent question is whether the impacts are such that they may be deemed acceptable, in the context of the receiving environment, or can be reduced to an acceptable level of impact through mitigation measures.

Of the seventeen viewpoints assessed it is anticipated that:

The classification of impact will be:
Neutral for ten of the viewpoints.
Positive for three of the viewpoints.
Negative for four of the viewpoints.

The short term impact (i.e. during construction and initial establishment period) will be:
Low for eleven of the viewpoints.
Medium for two of the viewpoints
High for four of the viewpoints.

The long term impact will be (i.e. after completion and development of mitigating landscape treatment):
Low for twelve of the viewpoints.
Medium for four of the viewpoints
High for one of the viewpoints.

7.8 Summary

It can be said then that the long term impact will result primarily in a low and neutral manner upon the surrounding environment.

The maturation of mitigating landscape treatment should ensure that of the four viewpoints experiencing impacts of a high level of visual impact during the short term, three will be reduced to medium, whilst the only remaining viewpoint with a high impact is of a positive classification.

It is notable that those viewpoints experiencing a long term negative impact concern a relatively small number of private residential properties. (In these cases, the negative classification is driven primarily by the loss of existing views over open space).

A number of factors contribute towards the ability of the site to absorb significant development of this scale with such relatively low incidence of negative visual impact:

- The site is located within an edge of town environment characterised by light industrial and commercial land uses – an environment in which the principle of development is well established.
- The proposed development is in keeping with the characteristics of surrounding land uses.
- The surrounding built environment and landform does much to limit the extent of the visual envelope.
- The retention of existing vegetation and additional strategic planting of screening vegetation as part of the overall developments landscape / amenity open space proposals will do much to ensure the appropriate integration of the proposals with the surrounding environment.

For these reasons it is considered that the development will result in an overall visual impact that is generally acceptable or can be mitigated through landscape planting to an acceptable level in the context of the receiving environment.

CHAPTER EIGHT: EFFECT ON THE ENVIRONMENT - FLORA & FAUNA

8.1 Introduction

This flora and fauna impact assessment has been prepared by Robertson & Associates. It qualitatively assesses the development of lands in three separate phases at the old Greenpark Race Course, Limerick within the context of the potential direct, indirect, secondary and cumulative impacts upon the flora and fauna presently existing on-site, and in the immediate environs.

The study area comprises a 48 hectare (approx.) parcel of land which is located between the Dock Road and the South Circular Road to the south west of Limerick city, Co. Limerick. The site is bordered to the east by a number of established and newly constructed residential estates, to the west by the N69 Dock road, to the north by a number of residences and the dock road industrial estate, while the Ballynaclogh River runs close to the southern perimeter of the subject lands. The lands to the west and northwest of the site are classified as developed industrial/commercial lands, while those located to the north and east of the site are of a residential nature. To the south of the site, the lands are undeveloped Greenfield comprised of wet marshes, wet grasslands and the Ballynaclogh River.

The site itself is classified as Brownfield comprised of a former grassed racetrack, regenerating areas which were once occupied by buildings and a system of water courses with associated vegetation. There are notable anthropogenic influences on the site with no habitats being of a purely natural origin. The topography of the site is quite varied, with the racecourse being flat but the lands formally occupied by the racecourse buildings being more undulated and at a higher elevation. Along the southern perimeter of the site there is a steep earth embankment separating the lands from the Ballynaclogh River. The lands are presently unused, except for sporadic dumping, and amenity walking.

The study area contains freshwater grassland, woodland, disturbed ground and built land habitats. Detailed habitat descriptions are provided later under section 8.4, Receiving Environment.

8.2 Methodology

The methodology for the flora and fauna study is outlined in Chapter 3.

8.3 Designated areas and protected species

A small portion of the southern perimeter of the site is located within a designated candidate Special Area of Conservation (cSAC) under the European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94 of 1997). The Shannon Estuary cSAC (Site Code 2165) is a very large site stretching along the Shannon valley from Killaloe to Loop Head/ Kerry Head, a distance of some 120 km. The site thus encompasses the Shannon, Feale, Mulkear and Fergus Estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head.

The site is a candidate SAC selected for lagoons and alluvial wet woodlands, both habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for floating river vegetation, Molinia meadows, estuaries, tidal mudflats, Atlantic salt meadows, Mediterranean salt meadows, Salicornia mudflats, sand banks, perennial vegetation of stony banks, sea cliffs, reefs and large shallow inlets and bays all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive - Bottle-nosed Dolphin, Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Atlantic Salmon and Otter.

In addition to the nationally rare Triangular Club-rush (Scirpus triqueter) found throughout the lower reaches of the cSAC, two other scarce species, Lesser Bulrush (Typha angustifolia) and Summer Snowflake (Leucojum aestivum), are recorded as being found within Ballinacurra Creek (along the Ballynaclogh River) which is adjacent to the proposed development.

A number of species listed on Annex I of the E.U. Birds Directive are also present within the cSAC, either wintering or breeding. Indeed, the Shannon and Fergus Estuaries form the largest estuarine complex in Ireland and support more wintering wildfowl and waders than any other site in the country. Most of the estuarine part of the site has been designated a Special Protection Area (SPA), under the E.U. Birds Directive, primarily to protect the large numbers of migratory birds present in winter.

While the site itself is not registered for containing any species under the Wildlife (Amendment) Act, 2000, the river directly adjacent to it contains species listed under the Flora Protection Order, 1999. Figure 8.1 depicts the extent of designated areas within and adjacent to the subject lands.

There are other designated areas which lie within a 10km radius of the site. The table below provides a list of designated areas in proximity to the site.

Table 8.1 Designated areas within a 10km radius of the site

Dúchas Site Code	Designation Type	Name	Approximate Distance From Site
00435	pNHA	Inner Shannon Estuary – South Shore	0.01km W
00438	pNHA	Loughmore Common Turlough	6km S
002001	pNHA	Knockalisheen Marsh	6km N
002048	pNHA	Fergus Estuary and North Shore	4km NE
0002165	cSAC	Shannon Estuary	0km
001013	cSAC	Glenmora Wood	3km N
077	SPA	Shannon Estuary	0.01km W

8.4 Receiving Environment

As mentioned previously the subject lands are located between the Dock Road and the South Circular Road, directly north of the Ballynaclogh River. With the exception of the south of the site the remaining lands around the site are developed. Residential development lies to the east and north of the site, while industrial development lies to the north-west and west of the site. Immediately to the south of the site lies the Ballynaclogh River, and some marshy pastoral fields, examples of which are also found beyond the River. As stated previously the Ballynaclogh River which is a cSAC, is a tributary to the River Shannon located approximately 1km to the west.

Overall the site is heavily anthropogenically influenced either through previous horse-racing activities, or more recent dumping and soil excavations. The feed factory adjacent to the north-western boundary of the site is undergoing expansion which has resulted in a re-alignment of the ditch along that portion of the boundary and the temporary storage of excavated materials within the subject lands.

Within the south-eastern corner of the lands there was once situated a number of buildings and temporary structures associated with the horse racing track which have since been demolished. Some remnant rubble from these buildings is found located throughout the site.

A small road runs from this area towards the entrance at the Dock road, effectively splitting the site into a larger northern section, and a small southern section. The lands within the northern section are comprised of an old grass racetrack and associated ditch system which was once mowed and maintained but has now become overgrown. Within the southern section there is a large drainage ditch which runs parallel to the river embankment which is surrounded by wet grassland. There are some hedgerows and treelines around the northern and eastern boundaries of the site as well as located throughout the lands. Notwithstanding past and recent activities, the subject lands were found to support a number of floral and faunal species which are particular to the south-west of Ireland and are considered to be relatively rare throughout the rest of the country. The lands also contain a small portion of habitat that is close in resemblance to an Annex 1 habitat (*Molinia* meadows).

There is a high diversity of habitats within the site, and despite the heavy anthropogenic influences, there is a high and ecologically interesting diversity of plant species. The habitat types identified during the survey fall under the following categories:

- Freshwater Habitat
- Grassland Habitat
- Woodland Habitat
- Disturbed Ground
- Built Land

Floral species lists for each habitat is given in Appendix A1. Figure 8.2 illustrates all habitat types present within the study area.

8.5 Freshwater Habitat

The proximity of the subject lands to the Ballynaclogh River and the River Shannon reflects in the high water table of the subject lands which has been combated over the years by a number of man-made drainage ditches (FW4 – Drainage Ditch) both around the perimeter and throughout the site.

- ***Drainage Ditches (FW4)***

As stated above there are a number of drainage ditches throughout the site chiefly broken into four categories; a large ditch along the southern boundary; a ditch along the northern boundary, a ditch around the internal perimeter of the racetrack; and finally a number of ditches within the centre of the racetrack. Some of the ditches, especially the one along the southern boundary are quite large, while others are quite dry. Old OS maps for the area show a number of other historical ditches throughout the site, which have since been piped underground and drain to the external ditches through concrete outlets.

Stretching through the southern boundary of the subject lands there is a large drainage ditch which is approximately 5m wide and 3m deep running in an east-west direction towards the River Shannon. This ditch forms the boundary of the River Shannon Lower Estuary cSAC within the subject lands. The bank of the river, and the associated habitat between the ditch and the embankment to the south of the ditch, are both contained within the cSAC. Flow within the ditch was quite slow overall. Floral diversity within the ditch was quite high, being dominated at the time of the survey by water plantain (*Alisma plantago aquatica*), flag iris (*Iris pseudacorus*) and horsetail (*Equisetum fluviatile*) in the water. Along the periphery of the ditch there was a stand of common reed (*Phragmites australis*). At instances along this ditch, especially towards to the south-western end of the site these stands of common reed are more prolific dominating the entire ditch area and excluding other emergent and submerged floral species. The bank of the ditch was characterised primarily by grasses such as Cock'sfoot (*Dactylis glomerata*), Yorkshire fog (*Holcus lanatus*), creeping soft grass (*H. mollis*) and some tufted hairgrass (*Deschampsia caespitosa*) along with soft rush (*Juncus effusus*) and jointed rush (*J. articulatus*). The flowering component of the ditch bank was comprised of common figwort (*Scrophularia nodosa*), meadowsweet (*Filipendula ulmaria*), water mint (*Mentha aquatica*), marsh thistle (*Cirsium palustre*), silverweed (*Potentilla anserina*), and hedge

bindweed (*Calystegia sepium*). The majority of the ditch was quite open, however there were sporadic occurrences of alder (*Alnus glutinosa*) and willows (*Salix cinerea, S. viminalis, S. alba*) along the edge. At the point where the southern ditch enters within the property boundaries it is dry for a distance of approximately 50m and is bordered on each side by a short line of mature white willows.

The ditch around the northern boundaries of the site commences by the small internal road where it is fed by an underground pipe which drains the land to the east of it by means of a concrete culvert. The vegetation within this stretch of the ditch is dominated by common reed with a greater presence of willows. Within the water itself water forget-me-not (*Myosotis scopriodes*) and fool's watercress (*Apium nodiflorum*) dominated, while teasel (*Dipascus fullonum*) and meadow vetchling (*Lathyrus pratensis*) augmented the banks of the ditch. (It is very rare to find Teasel beyond the east and north of Ireland, however this plant was also found in a site located approximately 4.5 km east of the site, indicating that it may be becoming locally occasional within the Limerick area). Approximately halfway between the start of this ditch and the feed factory the ditch-side vegetation has been cleared and an old fuel tank from a vehicle has been dumped within the ditch. There is noticeable hydrocarbon contamination within this area and to a lesser degree throughout the rest of the ditch between the internal road and the feed factory. This pollution is added to as the ditch approaches the south-western corner of the feed factory boundary where surface water run-off draining from the industrial processes immediately to the west of the site enters the ditch. At this point the water becomes quite stagnant and the floral composition is dominated by duckweed (*Lemna minor*) with some starwort (*Callitriche stagnalis*) while brambles (*Rubus fruticosus agg.*) were prevalent within the ditch bank. The ditch along the stretch of property beside the feed factory has been very recently re-aligned and as such it is comprised of a freshly-dug ditch approximately 1.5m wide with steep un-vegetated earth sides. The water within this ditch was also very stagnant, and dominated with green filamentous algae typical of eutrophic conditions. Beyond the feed factory the ditch reverts to its previous state however is still very stagnant, covered with fool's watercress, and duckweed with elder (*Sambucus nigra*) and hawthorn (*Crataegus monogyna*) on the bank edge. Further along the northern boundary the ditch widens out and becomes more oxygenated returning once more to a flora dominated by common reed, with some Canadian pondweed (*Elodea canadensis*) appearing. Approximately halfway along the northern boundary this ditch finally dries out.

A continual ditch runs around the internal perimeter of what was once the race track. The ditch is approximately one metre wide and an average of 0.5 metres deep. The western half of this oval ditch contains water, while the eastern half was dry at the time of the survey. Those areas of the ditch which convey water throughout the year were characterised by an abundance of common reed, flag iris, horsetail along with starwort, marsh willowherb (*Epilobium palustre*), bindweed, jointed rush, soft rush and duck weed. The remainder of the ditch is dry. At the north-eastern corner of the ditch a patch of marsh orchid (*Dactylorhiza fuschii* subsp. *okellyi*) were found at the base growing close to a small hawthorn tree. This subspecies of orchid is found only on limestone grassland within the west of Ireland.

The ditches within the centre of the racetrack formed a complicated criss-cross pattern. These ditches demonstrated a fairly similar floral composition to those located within the western portion of the oval ditch surrounding them, however common reed tended to be more dominant and the ditches were often surrounded by a thick band of lesser pond sedge (*Carex acutiformis*). It is rare to find lesser pond sedge in the west of Ireland. Some goat willow trees were noted along the edge of the some of the ditches.

Mammals

While otter (*Lutra lutra*) or mink (*Mustela vison*) are likely to be present along the banks of the ditch along the southern boundary, no signs (tracks, scat, prey etc.) of any were noted along the area surveyed. Otters or mink are highly likely to utilise the river habitat immediately south of the earth embankment along the southern property boundary and as such the southern ditch must be regarded as a viable portion of otter habitat.

Avifauna

These freshwater habitats are of significant ecological importance owing to the diversity of freshwater habitats within a relatively small area. A number of reed warblers (*Acrocephalus scirpaceus*) were noted within the common reed throughout the property where they are also likely to be nesting. A grey heron (*Ardea cinerea*) was also spotted flying along the southern ditch and fishing within the northern ditch close to the feed factory.

While none were spotted it would be expected to see mallard (*Anas platyrhynchos*), teal (*Anas crecca*), tufted duck (*Aythya fuligula*) or dipper (*Cinclus cinclus*) within the southern ditch.

Amphibian

It should be considered highly likely to discover frogspawn (*Rana temporaria*) within the ditches during the spring months.

Invertebrate

Intensive invertebrate usage of the site was highly evident due to the time of the year that the survey was carried out. The common blue damselfly (*Enallagma cyathigerum*) was prevalent throughout the ditch habitats as is to be expected for this time of the year. Other invertebrate fauna consisted of mayfly (*Ephemera spp.*) and damselfly (*Lestes sponsa*) noted above the open water. Water boatman (*Corixa punctata*) and pond skaters (*Gerris lacustris*) were noted within the edges of the ditches as were common water snail species (*Lymnaea peregra*). Common whitefly (*Aleyrodes proletella*) and emphid fly (*Empis spp.*), cardinal beetle (*Pyrochroa coccinea*), and a harvestman spider (*Phalangium spp.*) were also found within the vegetation surrounding the edge of the ditches.

While the majority of this habitat has been highly disturbed, it is still considered to be of high ecological value due to the floral diversity and composition and degree of connectivity to adjacent habitats. Due to the contiguous location of the southern ditch to the cSAC this ditch must be considered to be of International ecological vale.

8.6 Grassland Habitat

As indicated in Figure 8.2 the majority of the subject lands are taken up by grassland habitat. While the entirety of the site has been intensively managed and modified, the overall character of the grassland on site has been heavily influenced by the hydrologic regime of the area whereby the grass is considered to be classified as wet grassland (GS4).

- ***Wet Grassland (GS4)***

As stated above this habitat has been extensively modified through active drainage on-site, contains many species which most likely arose from re-seeding, was fertilised and treated with herbicides, has experienced dumping and demolition activities and was once regularly cut for silage. This level of intervention would normally dictate that the habitat is classified as improved agricultural grassland (GA1) or amenity grassland (GA2). However the local hydrological conditions mean that despite drainage attempts, these areas are periodically inundated to the extent that they are characterised by wet grassland species.

Overall the grassy component is dominated by perennial rye-grass (*Lolium perenne*), meadow foxtail (*Alopecurus pratensis*), rough meadow grass (*Poa trivialis*), and cock's foot, with purple moor grass (*Molinia caerula*) and soft rush appearing in wetter patches. The herbaceous component was dominated by such "improved" species as broad-leaved dock (*Rumex obtusifolius*), creeping buttercup (*Ranunculus repens*), silverweed (*Potentilla anserina*), clovers (*Trifolium repens, T. pratense*), creeping thistle (*C. arvense*), along with more characteristically "wet" species such as meadowsweet (*Filipendula ulmaria*), common figwort, bog stitchwort (*Stellaria uliginosa*), horsetail, and flag iris.

Closer to the hedgerows on the northern side of the property, creeping thistle, creeping buttercup, silver weed and couch grass (*Elymus repens*) were more prevalent with marsh thistle replacing creeping thistle in wetter areas. Banks of nettle (*Urtica dioica*) and brambles appeared at intervals along this boundary.

Within the centre of the former racecourse conditions were slightly wetter and the noted increase in plant diversity would also indicate the likelihood of lessened human intervention within this area. For the most part the same species as described elsewhere within this habitat were present in this area except that timothy grass was replaced by tufted hairgrass and common spike rush (*Eleocharis palustris*), and that both soft and hard rush (*J. inflexus*) appeared in far greater abundance. Knapweed (*Centaura nigra*), tufted vetch (*Vicia cracca*), stands of flag iris, meadowsweet, spear thistle (*C. vulgare*), and purple loosestrife (*Lythrum salicaria*) characterised this area.

Another variation within this habitat type is located between the southern drainage ditch and the dirt road running through the property. The vegetation of this area is influenced by the presence of the drainage ditch and the Ballynaclogh River to the extent that it is approaching the habitat classification of GM1 marsh, however there has been a great deal of anthropogenic influence within this area; as a result of which the grassland exhibits drier conditions characteristic of wet grassland GS4. This area contained a higher diversity and abundance of flowering plants such as; hawksbeard (*Crepis spp.*), clovers, medick (*Medicago lupulina*), marsh woundwort (*Stachys palustris*), purple loosestrife, creeping cinquefoil (*Potentilla reptans*), bindweed, self heal (*Prunella vulgaris*), meadowsweet, pignut (*Conopodium majus*), common vetch (*V. sativa*), creeping and spear thistle, and lesser skullcap (*Scutellaria minor*). (Lesser skullcap is locally frequent in the south-west of Ireland, but very rare elsewhere.) Closer towards the drainage ditch the vegetation is characterised by sorrel, perennial ryegrass, soft rush, silverweed, bird's foot trefoil (*Lotus corniculatus*), broad leaved dock and annual meadow grass (*Poa annua*).

Beyond the drainage ditch the grassland becomes more dominated by soft rush with the typical agricultural grasses being replaced by purple moor grass. This stretch is close in floral composition to an Annex 1 habitat listed in the Habitat Directive (*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils).

Due to the periodic inundation by water, the species diversity within this habitat is higher than that of other grassland habitats undergoing similar levels of anthropogenic influence. In particular the grassland located between the drainage ditch and the river embankment is considered to be of regional ecological value due to its high species diversity and connectivity to these two major freshwater habitats, however given that this area is contained within the cSAC boundary, and is close in floral composition to an Annex 1 habitat it must be considered to be of International ecological significance.

Mammals

No mammal species were recorded within this habitat during the time of survey. However due to this habitat's high floral species diversity and the relative degree of cover that it affords, it is likely to provide a valuable habitat for many mammals such as house mouse (*Mus musculus domesticus*), brown rat (*Rattus norvegicus*), rabbit (*Oryctolagus cuniculus*) and mountain Irish hare (*Lepus timidus hibernicus*) either for transit purposes (moving between feeding and shelter areas), feeding, hunting, shelter or burrowing. Any otters within the area are also likely to be found transiting through this habitat.

Avifauna

Avifaunal usage of this habitat was dominated by large flocks of swallow (*Hirundo rustica*) actively feeding throughout the day. In addition to this a number of crows (*Corvus corone*) and pigeon (*Columba palumbas)* were noted within this habitat. A total of three meadow pipits (*Anthus pratensis*) were flushed from the wet grassland habitat, however it is likely that more use this area.

The wet grassland habitat is being used by at least two nesting pairs, and most probably three nesting pairs of pheasant (*Phasianus colchicus*).

Given the proximity of the lands to the Shannon estuary it would be expected to see this habitat being used by such species as curlew (*Numenius arquata*), lapwing (*Vanellus vanellus*) and golden plover (*Pluvialis apricaria*) during the winter months for resting, and roosting. It would also be expected to find sky lark (*Alauda arvensis*), and magpie (*Pica pica*) within this habitat.

Invertebrates

Invertebrate usage of the wet grassland habitat contained many of the same species as were found on the ditch edges, but was principally dominated by the butterflies; meadow brown butterfly (*Maniola jurtina*) and large white butterfly (*Pieris brassicae*).

The flora and fauna species diversity of the majority of the wet grassland habitat should be considered to be of local ecological significance, while the stretch located between the southern drainage ditch and the river embankment must be considered to be of international importance.

8.7 Woodland Habitat

The woodland habitats located within the subject lands are comprised solely of hedgerows (WL1) and planted treelines (WL2).

- **Hedgerow (WL1)**

Hedgerows can be important wildlife habitats, providing refuge for many flora and fauna species, often being the last vestiges of semi-natural woodland in Ireland.

According to Ordnance Survey maps for the area and the previous EIS carried out for these lands there used to be a number of hedgerows within the racetrack area of the site which have since been removed, and hence the majority of this habitat is now found confined to the boundaries of the subject lands.

The extent of this habitat is featured in Figure 8.2 being confined to either the northern perimeter of the site, or along the remains of the internal racecourse infrastructure. With the exception of one stretch of hedgerow along a power easement, all of the hedgerows are scrappy, in poor condition, contain non-native species and do not have any distinctive features such as raised banks or stone walls.

The most western end of the hedgerow along the northern property line commences with a number of tall (approximately 20m) lawson's cypress (*Chamaecyparis lawsonii*) trees. Moving east from this point elements of the original hedgerow start to return comprised of ash (*Fraxinus exclesior*), sycamore (*Acer pseudoplatanus*), hawthorn, alder, willows and some elm (*Ulmus spp.*). Two-thirds of the way along the boundary non-native species such as eucalyptus (*Eucalyptus spp.*) starts to appear, culminating in a stand of planted silver birch (*Betula pendula*) with broom (*Cytisus scoparius*) and gorse (*Ulex europaeus*). The ground cover along this hedgerow was generally characterised by hedge mustard (*Sisymbrium officionale*), wild oat (*Avena fatua*), couch grass, Cock's foot, broadleaved dock and dandelion (*Taraxacum* agg.)

The hedgerow running along the south-eastern boundary of the subject lands is relatively undisturbed comprised of a canopy of ash, sycamore and grey willow, with a sub-canopy of hawthorn and alder. Towards the eastern end of this hedgerow the canopy disappeared leaving only a sub-canopy dominated by hawthorn and blackthorn (*Prunus spinosa*), while towards the western end the closer proximity to the river resulted in a dominance of willow and alder. There was a notable presence of ivy (*Hedera helix)* throughout this section of this hedgerow. The ground flora was vegetated with species such as hard fern (*Polystichum setiferum*), hart's tongue, ivy, nettle, bush vetch and tormentil (*P. erecta*).

Running in an east-west direction, immediately north of the disturbed ground associated with the racecourse buildings there is a small remnant of an old field boundary which is comprised solely of a scrappy line of hawthorn. This hedgerow culminates at another area of dumped construction and demolition rubble. A small part of this hedgerow continues in a north-south direction as shown in Figure 8.2. At this stage the hedgerow is of exceptionally poor ecological value and also contains some remains of landscaping such as skimmia (*Skimmia spp.*).

The last of the hedgerows within the subject lands is located along the eastern side of the internal road at the western end of the site. While this hedgerow is highly modified and derived from planting, it is considered to be of the highest ecological value due to its width. Essentially it is comprised of a wide band of planted downy birch (*B. pubescens*), with some peripheral occurrences of hawthorn and willow. The ground cover was quite sparse comprised of a "grassy" layer of cocksfoot, perennial ryegrass, annual meadow grass and timothy. The canopy in the central portion of this hedgerow has been removed to facilitate an overhead electricity line. Within this easement the ground cover was dominated by common reed and reed canary grass (*Phalaris arundinacea*) along with nettles and bindweed. This hedgerow culminates at the western end with a number of sitka spruce (*Picea sitchensis*) and osier (*S. fragilis*). At this point the canopy cover was very open permitting a strong dominance of broad-leaved willowherb (*E. angustifolium*) within the ground flora.

- **Treeline (WL2)**

Along the northern section of the eastern boundary there is a planted line of privet (*Ligustrum spp.*), while a tall line of Leyland cypress (*Cupressocyparis leylandi*) is situated to the west of the old cattle demonstration area.

Mammals

Hedgerows often act as wildlife corridors allowing mammal species to move and disperse between habitats. They can be important for bat species which use them as navigational guides and sometimes they may roost in mature hedgerow trees.

No direct sightings of mammals were made during the walkover survey. While no burrows were located, it would be highly likely for either or indeed both rabbit and mountain Irish hare to live, breed and forage within the subject lands. It is also most certain that house mouse and brown rat use these hedgerow habitats for shelter and feeding purposes.

While the hedgerows themselves are unlikely to be used as roosting locations for bat species, they would undoubtedly serve as important feeding grounds and navigational aids for bats roosting in the area.

Due to the high degree of connectivity between the hedgerow habitat and adjacent habitats, and the existence of freshwater habitats, this habitat is highly likely to be used by mammals.

Avifauna

Hedgerows can provide important habitats for a variety of bird species. They provide valuable feeding resources in the form of seeds and berries. In addition they provide nesting sites and shelter from weather conditions as well as good cover from predators.

A number of avifauna species were noted within the hedgerow habitat during the walkover survey. Those recorded include; blackbird (*Turdus merula*), robin (*Erithacus rubecula*), magpie (*Pica pica*), wren (*Troglodytes troglodytes*), and stock dove (*Columba oenas*). A nesting pair of goldcrest (*Regulus regulus*) were spotted within the under-scrub of the Lawson's cypress at the north-western corner of the subject lands, while a large number of swallows were feeding in and out of the hedgerows.

Additional species which may use this habitat would include; blue tit (*Parus caeruleus*), song thrush (*Turdus philomelos*), chaffinch (*Fringilla coelebs*), and sparrow (*Passer domesticus*).

Invertebrates

Hedgerows may support a variety of invertebrate fauna, despite the fact that these species are often inconspicuous and not always easily seen (a hawthorn tree is known to support over one hundred different insect species alone). Invertebrate usage of the woodland habitat was high at the time of the survey as evidenced by the large numbers of swallows sweeping in and out of the hedgerows.

The most noticeable of these insects were the flies including; bluebottle (*Calliphora vicina*), greenbottle (*Lucilla caesar*), clusterfly (*Pollenia spp.*) and hoverfly (*Volucella bombylans*). Butterflies noted comprised of; meadow brown and small white (*Artogeia rapae*), while black darter (*Sympetrum danae*), meadow grasshopper (*Chorthippus parallelus*), earwig (*Forficula auricularia*), wasp (*Vespula germanica*), white-tailed bumble bee (*Bombus lucorum*), and seven-spot-ladybird (*Coccinella 7-puncata*) were also present.

The hedgerow habitat running along the power easement and the hedgerow along the southern perimeter of the site provide a relatively high diversity of flora and fauna and are considered to be of high local ecological value. The remainder of the woodland habitats within the subject lands are of low ecological value.

8.8 Disturbed Ground

Approximately 30% of the subject lands are categorised as disturbed ground emphasising the strong anthropogenic influence upon the land. This disturbance was comprised of built structures which have since become derelict, and disturbed ground which was used for disposal of construction and demolition waste. These activities have since ceased and the ground is becoming recolonised (recolonising bare ground (ED3)).

- **Recolonising Bare Ground (ED3)**

The majority of this habitat is comprised of the south-eastern portion of the subject lands which were once occupied by various race-track buildings in addition to cattle display structures. All of these buildings except a cattle shed have since been removed. Throughout this area there are also a number of disused gravel roadways.

This area contains remnants of amenity grassland planting comprised of perennial ryegrass, annual meadow grass (*Poa annua*), and Yorkshire fog along with daisy (*Bellis perennis*), plantains, groundsel (*S. jacobaea*), coltsfoot (*Tussilago farfara*), clovers, self heal, thistles, creeping cinquefoil, ox-eye daisy and bird's foot trefoil. A single large privet tree comprises the only wooded elements within this section. A burdock (*Arctium minus*) plant is located along the southern extent of this habitat. This area would still appear to be maintained to some degree as vegetation growth heights were quite low. Interspersed throughout this section there are still areas of hard standing remaining such as the derelict cattle demonstration area which is now becoming colonised by white willow saplings. There is a high degree of littering and dumping within this area.

There is a moderately large area at the existing entrance to the site from Dock Road which is highly disturbed from the dumping of construction and demolition waste resulting in a highly variable topography. This area was vegetated with spear thistle, common figwort, common vetch, black medick, red clover, remote sedge (*C. remota*), greater plantain (*P. major*), scarlet pimpernel (*Anagallis arvensis*), and wild oat. The rubble mounds were characterised with great willowherb (*E. hirsutum*), soft rush, red clover and groundsel. Slightly barer patches revealed such species as wild turnip (*Brassica rapa*), broad leaved dock, scentless mayweed (*Tripleurospermum inodorum*), knotweed (*Polygonium aviculare*), redshank (*P. persicaria*), and hawksbeard. There were a number of small white willow and osier saplings growing throughout this habitat.

Mammals

No direct sightings of mammals were made during the walkover survey.

A daytime visual survey of the cattle shed was made for the presence of bat species. No signs (i.e. bat droppings, insect wings (from feeding), oil (from fur), urine stains, scratch marks, or bat corpses) of bat usage were noted. The roof spaces and general construction of the building suggests its unsuitability for bats.

Avifauna

Avifaunal usage of this habitat was dominated by the crow (*Corvus corone*) and the rook (*C. frugilegus*).

Overall this habitat is of little or no value to fauna species and overall is of no ecological value.

8.9 Built Land

The built land habitat is chiefly comprised of a line of earth banks (earth banks (BL2)) along the southern boundary separating the site from the Ballynaclogh River.

- **Earth Banks (BL2)**

The majority of the southern boundary of the subject lands is separated from the flood plain of the Ballynaclogh River by a 3m (approximate) tall earth embankment. The embankment is predominantly "grassy", but shows a mixture of influences, with wet species from the river bank, and disturbed species from the surrounding lands and the disturbance of creating the banks themselves.

The grassy component was characterised by lesser pond sedge, couch grass, cocksfoot, and hard rush with nettle, cleavers (*Galium aparine*), bindweed, sorrel, coltsfoot, groundsel, teasel, figwort, meadowsweet and yellow flag iris. A few small willow saplings were noted throughout this habitat. As stated previously it is rare to find lesser pond sedge in the west of Ireland.

Mammals

No direct sightings of mammals were made during the walkover survey. However, it would be highly likely to find otter and/or mink using this habitat along with the house mouse and brown rat.

Avifauna

No birds were identified within these habitats during the survey.

Invertebrates

The soldier beetle *Rhagonycha fulva* was noted hunting for prey on the ragwort. Seven spot ladybird, the hoverfly *Syrphus ribesii*, aphid (*Macrosiphum rosae*), and long-legged spider (*Tetragnatha extensa*) were also noted. At the time of the survey the vegetation was quite wet and as such there was a high prevalence of netted slug (*Decroceras reticulatum*), brown-lipped snail (*Cepaea hortensis*) and amber snail (*Succinea putris*). This habitat was also used by large white butterfly and meadow brown butterfly.

Overall this built habitat is of moderate ecological value, however in light of the physical support that it provides to the adjacent river habitat and the fact that it is contained within the cSAC boundary it is considered to be of Internationally significant ecological importance.

8.10 Habitats in the Surrounding Area

As stated previously, residential development lies to the east and north of the site, while industrial development lies to the north-west and west of the site. Immediately to the south of the site lies the Ballynaclogh River, and some marshy pastoral fields, examples of which are also found beyond the River. Excepting of course the Ballynaclogh River, the surrounding lands are of a similar or lower ecological value to those contained within the subject lands. The Ballynaclogh River is a cSAC and as such is considered to be of international significance. The Shannon Estuary SPA and NHA lie immediately to the north-west of the site.

The Ballynaclogh River is bordered on both sides by tall vegetated earth embankments. The back face of the earth embankments exhibit more disturbed conditions through the presence of nettles and teasel, along with meadowsweet and hemlock water dropwort (*Oenanthe croccata*). Hemlock water dropwort is an extremely poisonous plant.

Behind the earth embankments the ground flattens off and is vegetated with a thick swath of common reed and lesser pond sedge with interspersed marsh willowherb and bindweed. Additional species noted within this area included willows, marsh marigold (*Caltha palustris*), flag yellow iris, water for-get-me-knot, marsh ragwort (*S. aquaticus*), bulrush (*Typha latifolia*), pink water-speedwell (*Veronica catenata*) and a distinctive subspecies of curled dock (*Rumex crispus subsp. Uliginosus*).

Deep channels are cut at intervals through the reed beds either side of the river, and it was within these channels that patches of summer snowflake (*Leucojum aestivum*), English scurvy grass (*Cochleria anglica*), water plantain, grey club rush (*Scirpus tabernaemontani*) and sea club rush (*S. maritimus*) were present. Summer snowflake is often a garden escapee however as in this instance it has become native in Limerick, Clare and Wexford. During the 2001 survey triangular club rush (*S. triqueter*) was found at four locations along the adjacent stretch of river, just below the reed zone in tidal muds. The greatest abundance of triangular club rush was found in a deep channel along with fool's water-cress, water starwort and amphibious biswort (*P. amphibium*). Triangular club rush is locally abundant along the bank of the Shannon in Limerick City and for some distance downstream however it is listed in the *Flora Protection Order, 1999* (SI 94 of 1999) as a protected plant.

8.11 Evaluation of Habitats

In general terms the freshwater habitats within the site are of mixed ecological value. The ditches along the northern boundary of the site are of low ecological value, while the ditches within the centre of the racetrack are considered to be of moderate local ecological value. The ditch running parallel to the southern boundary is of high International ecological value. The area containing the marsh orchid is to be considered to be of high local ecological value.

With respect to the grassland habitats the wet grassland on site is considered to be of just local ecological significance with the exception of those grasslands located between the earth embankment and the southern ditch which by virtue of their presence within a cSAC are to be regarded as of international ecological significance.

The hedgerow habitat running along the power easement and the hedgerow along the southern perimeter of the site are regarded as of high local ecological value, while the remainder of the woodland habitats within the subject lands are of low ecological value.

The disturbed ground habitat offers no significant ecological value. Likewise the earth embankments are of moderate ecological value, however in light of the physical support that it provides to the adjacent river habitat and the fact that it is contained within the cSAC boundary it is considered to be of Internationally significant ecological importance.

8.12 Characteristics of the Proposal

Planning permission for the infrastructure associated with the proposed development has already been granted. This planning permission entails the provision of all service infrastructure, internal roads and the treatment of all surface water by means of an attenuation pond which will discharge to the Ballynaclogh River.

It is envisaged that the proposed development will be developed on a phased basis consisting of approximately 900 residential units, approximately 34,000sq.m. of retail/commercial floorspace, and a recreational amenity area; all of which will be supported by the aforementioned granted infrastructure.

In order to account for the effects of accumulative development, and in light of the cSAC, the impacts associated with both the proposed development and the granted infrastructure development will be assessed within this section.

In this light, the proposed development can be separated into three separate yet integrated areas:-

- Area A – The Retail/Commercial Area (an application for which is now withdrawn)
- Area B – The Residential Area
- Area C – The Amenity Area

Area A – Retail / Commercial Area. A proposed retail development on this area has been withdrawn from consideration for planning permission.

Area B – Residential Area. It is proposed to ultimately develop approximately 900 residential units within the north-eastern section of the site. While these houses will be developed on a phased basis, commencing with just 353 units, the infrastructure for the entirety of the development will proceed as granted. It is also proposed to provide a neighbourhood centre which will include; retail unit, doctor / dentists, crèche and café.

Area C – Amenity area. The amenity and recreation lands at Greenpark include a range of passive and active recreation opportunities all located within the southern portion of the subject lands. The formal recreation facilities at Greenpark include four tennis courts, one full size soccer pitch and ten five a side pitches. The passive recreation features include open grassy spaces for informal recreation, woodland and riverside walks and viewing/lookout points. The attenuation lagoon is a focal point on the site, treating all surface water arising from Areas A, B and C prior to discharge to the river. Some of the spoil from the excavation of the attenuation areas is used to create earth mounds and rolling topography on the site enclosing and sheltering the lagoon.

Area C is located the closest to the cSAC boundary and as such great attention has been paid to this issue during the design stage. A minimum set-back of 10 metres has been maintained between the cSAC boundary and the amenity developments (with the exception of one small area of paved walkway which comes within 5m of the cSAC boundary). It was not possible however to site the attenuation pond outside of the cSAC, as this had already been permitted, and as such a portion of the pond, and of course the discharge infrastructure, are sited within the cSAC. The physical location of the attenuation pond will still be curtailed to the development-side of the embankment separating the subject lands from the Ballynaclogh River, which will substantially reduce impacts to the river; however it will be necessary to breach the embankment at one small point and carry out works within the riparian area of the river to put in place the discharge infrastructure.

Aside from the amenity planting within Area C, it is also proposed, subject to agreement from National Parks and Wildlife to augment the lands between the cSAC boundary and the river embankment with sensitive native wetland woodland planting.

8.13 Potential Impact of the Development

8.13.1 Construction Phase

The potential negative impacts associated with the construction phase of this proposed development will involve the physical, and direct disturbance of the majority of the drainage ditch, wet grassland, treeline and recolonising bare ground habitats on site. In addition to this a small portion of the earth embankment and adjacent Ballynclogh River, along with the hedgerow habitat will be directly impacted. Direct construction impacts may involve the fill of lands will significantly impact on the existing habitats.

Direct Impact

The direct impact to the drainage ditch habitat will result in the permanent loss of the majority of this habitat. The ditch running along the northern boundary will be retained but the remainder of the ditches including the one adjacent to the cSAC boundary will be removed. The impact of the removal of the ditch containing the marsh orchid for the residential development is to be considered as a negative impact of high local ecological significance, and the removal of the ditch along the boundary of the cSAC for the attenuation pond is to be considered as a negative impact of high international ecological significance. The removal of the remainder of the ditches for the amenity, residential and retails developments are regarded as a negative impact of moderate local ecological significance.

The entirety of the wet grassland habitat and potential wintering bird resting areas will be removed by the amenity, residential and retail phases. The retail and residential phases will replace the grassland habitat with hardspace development, while the amenity phase will replace the grassland habitat with a mixture of amenity grassland, woodland planting and freshwater habitats. The wet grassland area of highest ecological value between the embankment and the southern ditch will be replaced by a wet woodland habitat. These proposals will result in a low negative local ecological impact associated with the residential, retail and amenity phases. The proposed wet woodland planting between the embankment and the southern ditch is to be viewed as a positive moderate ecological benefit to the cSAC.

The internal treeline to the west of cattle display area will be permanently removed. These species are non-native and this impact is of no ecological significance.

The birch hedgerow along the power easement will be removed by the infrastructure and amenity phase of the development. This loss of bird nesting habitat should be viewed as a negative impact of moderate local ecological significance.

The recolonising bare ground habitat will be removed by the residential and amenity phases, however this is considered to be of no ecological significance.

The discharge pipe for the attenuation pond will be punched through a section of the earth embankment separating the site from the Ballynaclogh River. While the earth embankment itself offers little ecological value, its physical structure is an integral part of the cSAC ecosystem. In this regard great care has been taken to minimise the impact associated with the construction of the discharge pipe by punching it through the embankment rather than cutting a small valley in the embankment. As it stands the breaching of the foot of the embankment with a discharge pipe will be of no ecological significance as the structure of the embankment will not be altered.

Indirect Impact

Often times it is the indirect and secondary impacts associated with a proposed development that can be of greater environmental concern than the direct ones. In this instance many of the potential indirect impacts such as disturbance of the remaining drainage ditches, hedgerows, treelines and adjacent habitats through; compaction, vehicular movements, siltation, spoil and materials storage, diesel spills etc., are of direct concern.

Unless construction within the subject lands is carefully controlled there is potential for moderate negative ecological impacts to the habitats remaining on site.

Due to the physical separation offered by the earth embankment along the southern boundary and the minimum 10m set-back distance from the cSAC there is minimal potential for construction related indirect impacts to the Ballynaclogh River cSAC. The one exception to this is the laying of the attenuation pond discharge pipe beyond the earth embankment where there is potential for high negative ecological impacts of international significance if not carried out with care.

8.13.2 Operational Phase

Direct Impact

Once operational all surface and foul water will be adequately treated and as such will not present an ecological impact. A hydrocarbon and silt interceptor will be placed on the discharge pipe of the attenuation pond prior to discharge which will ensure that any fugitive pollutants will be captured during periods of peak demand upon the attenuation pond.

Indirect Impact

There is potential for the misuse of pesticides, herbicides and fertilisers within proximity of the attenuation pond which has a hydrological link to the Ballynaclogh River.

"Do-Nothing" Scenario

Should the proposed development not proceed the lands would remain under their current use.

8.14 Avoidance, Remedial or Reductive Measures

8.14.1 Mitigation by Avoidance

The *Wildlife (Amendment) Act, 2000* prevents the cutting or destruction of hedgerows from the beginning of March through to the end of September primarily to avoid negative impacts to nesting bird species. As such, those areas of hedgerow and treeline should be removed outside of this time period. This will ensure that no avi-fauna is directly affected by the proposed development.

The application of fertilisers, herbicides or pesticides must be avoided within 15m of the edge of the attenuation pond, thus negating the possible introduction of such chemicals to the Ballynaclogh River system.

8.14.2 Mitigation by Reduction

Taking measures to limit the working area during the construction phase will reduce the impacts of the development on the habitats within and adjacent to the subject lands. The construction area should be clearly delimited and machinery should operate only within the allocated area.

During dry windy days in the construction period sprinkler systems should be installed to prevent any dust blow to areas outside the delimited construction areas.

All construction and operation related fuel should be contained within specially constructed bunds to ensure that fuel spillages whether accidental or otherwise are fully contained.

Where construction work is adjacent to the hedgerows to be retained, a buffer zone of at least 5 metres from the drip line of trees should be observed to prevent damage to roots and branches.

It is recommended that the applicant utilises floating slit booms as detailed in Figure 8.3 during construction works associated with the laying of the discharge pipe within the river. Floating silt booms are constructed of geotextile membrane which will permit the movement of water past the temporary barrier however will retain any construction related silt. The floating boom should be placed a short distance downstream of the pipe laying works to catch any disturbed sediments. The floating boom must not traverse the entirety of the river and should only remain in place during the pipe laying process. All construction machinery and the temporary storage of excavated materials must not occur on the embankment side of the river. The floating boom should be inspected daily. In light of these controls there is no ecological need to restrict the timing of these works.

The use of chemicals on site, including concrete must adhere to Shannon Fisheries Guidelines.

The marsh orchid occurring within the site should be relocated within a suitable area in the amenity phase. This relocation will have to take place in June when the plant first appears. No construction can commence within a 10m radius of this area until such time as a viable number of the orchids are relocated. A suitable area for the relocation would be in the undisturbed areas around the attenuation pond. The marsh orchid is not a protected species and as such it does not need to be relocated under licence from NPWS, however it is recommended that a landscape or ecological professional carries out these works.

8.14.3 Mitigation by Remedy

Remedial measures involve the creation or enhancement of new areas of habitat to mitigate the loss of existing areas. While habitat creation will have a positive impact on the new environment it does not fully compensate for the loss of mature habitat and should be considered alongside avoidance and reductive measures.

It is proposed to plant the area between the earth embankment and the southern ditch which is presently classified as wet grassland habitat with a wet woodland habitat. It is likely that such species as alder (*Alnus glutinosa*), willows (*Salix fragilis, S. alba, S. viminialis*), birch (*Betula pendula*) and ash, along with meadowsweet (*Filipendula ulmaria*), wild angelica (*Angelica sylvestris*), yellow pimpernel (*Lysimachia nemorum*) and purple loosestrife (*Lythrum salicaria*) will be planted. The provision of this planting will increase the ecological value of the immediate area and enhance the ecological value of the cSAC.

Ecological and landscape value will also be enhanced by the planting of such species as yellow iris (*Iris pseudacorus*), horsetail (Equistum fluviatile), water forget-me-not (*Myosotis scorpiodes*), brooklime (*Veronica beccabunga*), summer snowflake (*Leucojum aestivum*), triangular club rush (*Scirpus triqueter*), lesser pond sedge (*Carex acutiformis*), yellow water lilly (*Nuphar lutea*), white water lilly (*Nymphaea alba*), and arrowhead (*Sagittaria sagittifolia*) within the attenuation pond. It is also proposed to plant wet woodland mixes around the attenuation pond. The provision of such a wetland habitat which will be connected to a number of other ecological habitats, creating a wildlife link to the cSAC will greatly enhance the ecology of the area and provide a valuable compensatory resting and roosting area for wintering bird species.

8.15 Predicted Impact

Taking the above mitigation measures into account the following predicted impacts will apply.

8.15.1 Construction Phase

Direct Impact

The relocation of marsh orchid elsewhere within the site will result in a neutral impact to the ditch containing that species, while the proposed wet woodland planting and the habitat

provided by the attenuation pond more than compensates for the loss of the drainage ditches within the site. In light of these mitigation measures there will be no resultant significant direct impact associated with the drainage ditches occurring on site.

The low negative local ecological impact to the wet grassland habitat associated with the residential, retail and amenity phases will be somewhat lessened by the proposed habitat creation measures. The availability of open grassed areas in the amenity phase and the freshwater habitat will serve to enhance the exiting resting and roosting possibilities for wintering bird species.

The removal of trees outside of the nesting period will negate any direct impact to birds, reducing the loss of the reline and the hedgerow by the power easement to a negative impact low local significance.

The direct impacts to the recolonising bare ground and the earth embankments will remain as of no ecological significance.

Direct construction impacts will involve the fill of lands will significantly impact on the existing habitats.

Indirect Impact

The control of the construction area will result in negligible impacts to the remaining hedgerow, drainage ditch, treelines and adjacent habitats.

Likewise the use of floating silt booms and construction area controls will result in negligible ecological impacts to the cSAC Ballynaclogh River ecosystem.

The control of potentially polluting substances during construction will reduce the potential risk to the freshwater habitat to the extent where it will be non significant.

8.15.2 Operational Phase

The control of potentially polluting substances during operation will reduce the potential risk to the Ballyncalogh River system via the attenuation pond to the extent where it will be non significant.

The creation of the pond and wet woodland habitats, and the ecological corridor between the amenity areas and the cSAC will help to enhance the ecological value of the area.

8.16 Monitoring

It is recommended that monthly sampling of the discharge pipe from the attenuation pond is carried out to ensure its effectiveness and to alert of any chronic and uncontrolled releases to the pond.

CHAPTER NINE: SOILS AND GEOLOGY

9.0 General

Because of the nature of the subject development, there will be no significant effects on soils outside the site. The site is located in Greenpark, Limerick in an area which is already urbanised and is effectively a brown field site. Works have commenced on site infrastructure including access roads and stormwater disposal which were the subject of a previous planning permission.

9.1 Receiving Environment

The site slopes from South Circular Road to Dock Road and is currently partly developed. The soils character for the site is representative of the general area, i.e. Alluvium from the tidal estuary.

A site investigation based on records from the previous construction works adjacent to the site, have been consulted.

Previous records and the present investigation indicate that the substrata consisting of varying depths of clay below the topsoil cover. Rock was encountered at depths 4.0m – 17.0m beneath ground level (BGL).

Ground water was encountered in the form of seepage varying with the tide between 0.6m and 3.0m BGL. Standing water level was observed at 0.6m BGL.

9.2 Characteristics of the Proposal

The construction of commercial units, houses, roads and other paved surfaces will take place in a phased manner. Extensive stripping of the upper 0.15 - 0.4 m of soil layer is involved. The foundation to buildings will vary throughout where appropriate conventional footings will be used however below a ground level of 2.5m OD piled structures will be considered for practical and economical reasons.

9.3 Potential Impact of the Proposal

Removal of the upper soil layers is likely over an extensive area in developments such as this during the construction stage. The stripped area will be covered by commercial units, roads and other paved areas during the operational stage. Under a do nothing scenario the site would remain in its current condition.

9.4 Remedial or Reductive Measures

The mitigation measures in the Flora and Fauna report will be adhered to. Imported fill material and soil will in time of dry weather be sprinkled using water bowsers to limit the rise of dust and airpborne particles. This will be a temporary measure during construction phase only as it will not be necessary during the operational phase.

9.5 Predicted Impact of the Proposal

Stripping of the upper solid layer (topsoil) will occur over an extensive area of the site during the construction stage. The stripped area will be covered with commercial units, housing, roads, other paved areas and some landscaping. The worst case scenario is not applicable.

9.6 Monitoring

Not applicable.

9.7 Reinstatement

Normal post construction reinstatement will take place where necessary.

9.8 Requirement to raise land levels

The Ballynaclough River is currently contained within embankments that are on average 5.15m (OD Malin) high. This is a flood preventative measure as the highest recorded flood level of the Ballynaclough River is 4.15m (OD Malin) which was recorded in 1961 and also in 1999. More specific details are provided in Chapter 10 of the EIS report.

Therefore a minimum design finished floor level of 4.5m (OD Malin), which is a preventative measure, is required to take account of the unlikely threat of flooding.

9.9 Existing & proposed land levels

The existing levels of the lands at Greenpark vary across the site. Land levels at the boundary to Mattie McGuire\Roche's Mills properties are in the order of 1.2m (OD Malin). Levels adjacent to the M^{c}Inerneys development are approximately 0.75m (OD Malin).

As all ground floor levels should be constructed to a minimum of 4.5m (OD Malin), it is required to raise the current land levels to approximately 4.0m (OD Malin). This will allow for road make up construction, floor slab construction etc.

9.10 Existing Receiving Environment

The existing environment consists of low lying lands that are covered almost in their entirety by common reeds and grasses. Drainage is via a system of open ditches located on the periphery of the lands. These ditches also have an inter-tidal storage capacity. Existing open ditches in the centre of the lands have a limited drainage capacity in that they are not connected to any of the existing drainage systems.

9.11 Materials and methods of operation

The existing 0.15m to 0.4m of topsoil will be stripped prior to the commencement of filling. Clean inert construction and demolition material and excavated subsoil material will make up the bulk of the fill material. The material will be free from contaminants and imported onto site using 20t and 30t rigid and articulated HGV's. A tracked dozer will be used to spread the material across a predetermined area to a predetermined thickness.

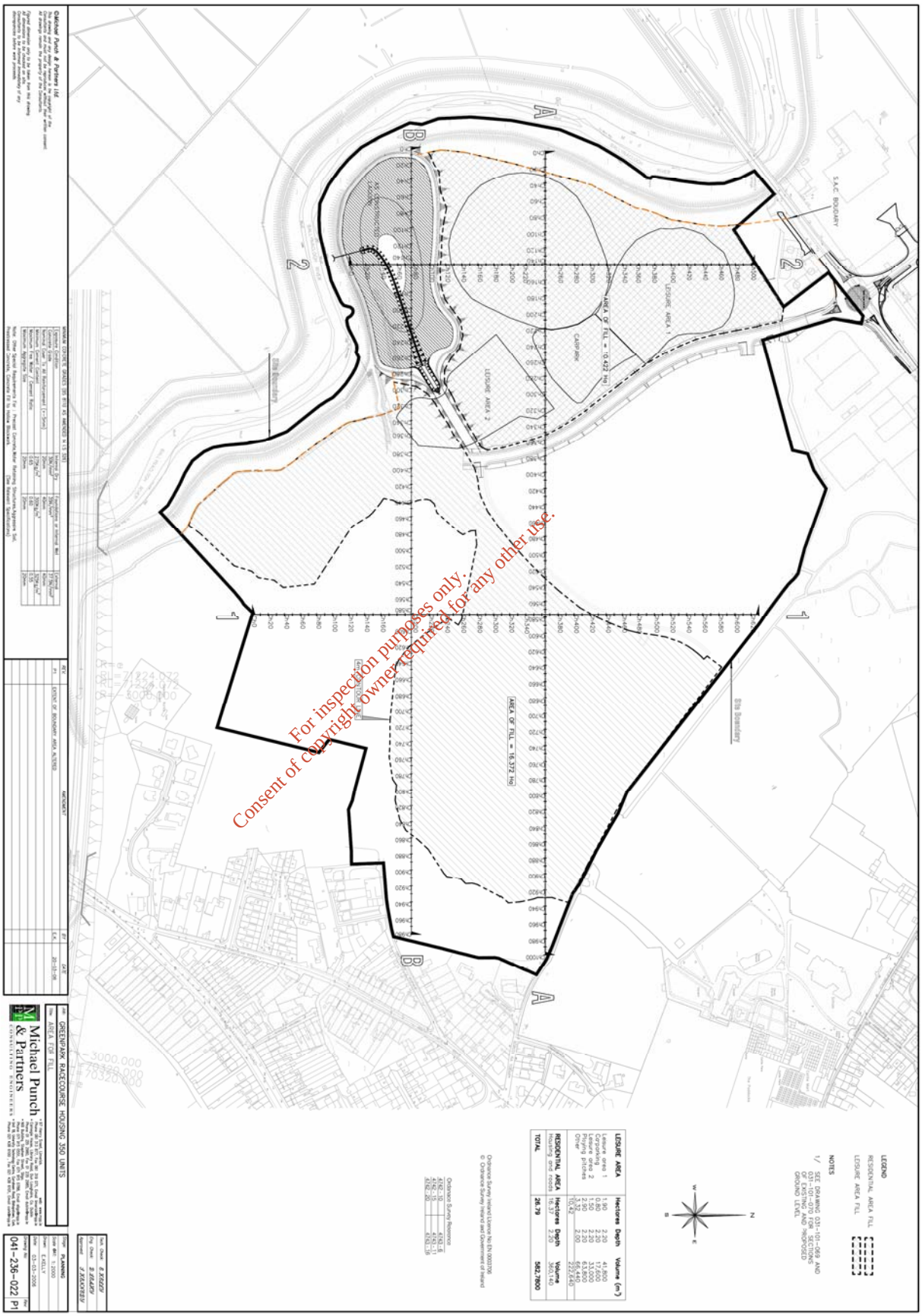
Vibrating rollers shall be used to compact the material in accordance with the engineers specifications.

Smooth wheeled non-vibrating rollers may also be used, again compacting the material in accordance with the engineer's specifications.

9.12 Volumes & tonnages

The residential area of the site has been considered in its entirety for filling purposes. The leisure area has been divided into individual elements so that the filling requirements of each of these elements can be considered. Details of the filling required are shown on Michael Punch and Partners Drawing No. 041-236-022 Rev P0

Figure 9.1 PROPOSED FILL



The overall development will involve the filling[5] of land to raise ground levels with an average fill depth of 2.2 m. In summary, the fill areas have been identified on attached drawings as the Leisure Area and the Residential Area. The Leisure Area will provide for fill at Leisure Area 1 which will have approximately 41,800 m3 of fill; the Car Parking Area, which will have approximately 17,600 m3 of fill; the Leisure Area 2 which will have approximately 33,000 m3 of fill; the Playing Pitches which will have approximately 68,800 m3 of fill and other areas which will have approximately 66,440 m3 of fill. The Residential area will have approximately 360,140 m3 of fill.

9.13 Monitoring & Controlling

Only material consisting of demolition & construction material and excavated subsoil will be accepted as suitable material for filling of the site. All other material will be turned away and the source of the material and the carriers noted for future reference.

Only licensed carriers will be allowed to deposit material on the site. Any material that is placed on the site by third parties without the approval of the developer shall be removed to an appropriate landfill facility.

The nature of the filling material will ensure that it is relatively porous. However contouring of the fill material will ensure that minimal ponding of the surface water will occur. Settlement ponds will be provided to remove any suspended solids from the water before it is released into the existing drainage network

In time of dry weather, it will be required to use water bowsers to limit the rise of dust and airborne particles.

9.14 Potential impact of the proposal

Existing Soils & Geology

Filling of the site will effectively surcharge the existing underlying substrata, resulting in an increase in pore water pressure. However this will dissipate over time through consolidation of the material. This will most likely result in settlement of the imported material.

There is likely to be no change in ground water levels.

Surface water

The final level of the land will be contoured such that surfacing water on the filled lands will be guided towards a settlement pond located on the periphery of the filling. Once the surface water is free from suspended solids the water will be allowed to discharge normally into the existing open ditches.

9.15 Impact on traffic

During the course of the filling operations there will be a considerable increase in the volume of construction traffic accessing the site. Access to the site would be via the recently constructed roundabout on the dock road. More details concerning the impact of the proposed filling operation can be had from the Traffic Impact Assessment of this report.

[5] Density of fill taken as 1.8t/m^3

CHAPTER TEN: SERVICING OF THE SITE

10.1 Foul Drainage

10.1.1 Receiving Environment

The site is partly developed with a racecourse and associated facilities, these will be demolished and in its place, it is proposed to construct residential and commercial units. Limerick City Council has constructed a new foul interceptor sewer through the site. It is proposed that all foul sewage from the site will discharge to this sewer.

The development represents a logical extension of the Urban Area where existing services and community facilities are available.

10.1.2 Characteristics of the Proposal

A gravity foul sewer pipe network will be constructed to serve the commercial and housing development.

The proposed development will comprise dwellings and based on a domestic loading of 250 lit/ head/day the peak flow at 6* DWF (dry weather flow). The commercial units have been designed on the basis of 56cu.m per hectare DWF.

10.1.3 Potential Impact of the Proposal

Effects of the commercial development with regard to foul drainage are:

- Pipeline construction activity during the construction stage.
- A demand on the resources of the Local Authority sewer network and on the proposed waste water treatment facilities.

Under the do nothing scenario the above potential impacts would not arise.

10.1.4 Remedial or Reductive Measures

In discussions with the Local Authority Consulting Engineers they have indicated that the existing sewer constructed as part of the Limerick Main Drainage Scheme should be capable of taking the foul sewage

Water consumption will be conserved using low volume flushing cisterns.

10.1.5 Predicted Impact of the Proposal

Pipeline and associated works will be carried out as part of the construction phase for the development works element of the project, i.e. roads, parking, water supply and main drainage infrastructure.

There will be an additional demand on the Local Authority foul sewer collection and treatment system. It is not anticipated that the additional flow contribution to the drainage system will cause any difficulties regarding collection or subsequent treatment. A worst case scenario does not arise in this instance.

10.1.6 Monitoring

Not applicable.

10.1.7 Reinstatement

Normal post construction reinstatement will take place.

10.2 Surface Water

10.2.1 Receiving Environment

The proposed development is located adjacent to existing serviced developments. An effective impervious area of 65% approximately would be typical of a site of this nature in its current state. The existing run-off on the basis of topography and an impermeability factor of 25% is estimated. The existing drainage network forms part of an inter-tidal storage system.

10.2.2 Characteristics of the Proposal

A separate surface water sewer system will be provided for houses, commercial units, roads and hardstandings. The proposed sewer system will discharge to a lagoon which will form an inter-tidal storage wetlands. The lagoon has been designed to accommodate the proposed development and adjoining lands as provided for by independent report prepared by Limerick Corporation. Construction has commenced on the lagoon and collection storm sewers which were the subject of a previous grant of planning.

10.2.3 Potential Impact of the Proposal

Potential impacts during the construction stage to be expected include pipeline construction and associated works activity. Run-off during the operational stage from the proposed development to the drainage system will be limited to existing run-off from the site. Under a do nothing scenario the status quo in terms of the run-off would be maintained.

10.2.4 Remedial or Reductive Measures

Limited storage will be provided within the drainage network. The finished levels will be related to the highest recorded tide, the site will be raised and inter-tidal, storage will be provided in the lagoon.

10.2.5 Predicted Impacts of the Proposal

Pipeline and associated construction will be carried out as part of the general construction programme for the commercial development works (i.e. roads, water supply and main drainage infrastructure).

10.2.6 Monitoring

Not applicable.

10.2.7 Reinstatement

None applicable.

10.3 Water Supply

10.3.1 General

The site is located in an urbanised area where mains water are available , for the entire development there is the option of connecting to the Limerick City Council watermains to the surrounding the site.

10.3.2 Characteristics of the Proposal

The commercial development will generate a demand for water on the basis of 1.5 times domestic demand which on the basis of an allowance of 180 litres / head. The residential development will be supplied at 2.5 time average based on an allowance of 225 lit/sec.

The fire fighting demand is estimated at 1100 gallons / minute and the watermains are sized at 150mm diameter throughout to cater for this demand.

10.3.3 Potential Impact of the Proposal

Potential impacts during the construction stage to be expected include pipeline construction and associated works activity. The development will increase the domestic demand on the Local Authority watermain supply. Under a do nothing scenario the status quo in terms of the run-off would be maintained.

10.3.4 Remedial or Reductive Measures

It is proposed that each dwelling will have an attic storage tank providing 24 hour storage to each dwelling. In addition water conservation measures in accordance with the latest technology will be incorporated in the sanitary facilities.

10.3.5 Predicted Impacts of the Proposal

Pipeline and associated construction will be carried out as part of the general construction programme for the commercial development works (i.e. roads, water supply and main drainage infrastructure).

10.3.6 Monitoring

Not applicable.

10.3.7 Reinstatement

None applicable.

10.4 Flooding

There are extensive embankments on both banks of the River Shannon. The highest flood level recorded in Limerick was 4.16mOD Malin in 1961, with a similar level being recorded at Christmas 1999. The embankments generally are at a design level of 5.5mOD Malin.

The OPW require approval under section 50 of the 1945 Arterial Drainage Act for any interference with their drainage schemes. The highest recorded tide level of approximately 4.16mOD Malin is clearly an extreme level with a low probability of occurrence (1961, 1999), and represents a coincidence of extreme factors (tide, barometric pressure, adverse wind and river flows).

It is noted that much of Limerick is under the highest recorded tide level. In February 1997 there was some flooding along the Ballinacurra Creek as result of topping of the embankments. The tide level recorded was approximately 4.1m OD Malin. There was no major flood damage recorded. The OPW had no reports of flooding, suggesting that no material damage occurred.

At Christmas 1999 there was a water level of approximately 4.1mOD Malin. As a result there was minor flooding at Ballykeefe. Some gardens were flooded but no buildings. The reason for this given by the office of Public Works was a temporary lowering of embankments by Limerick Main Drainage Contractors. This was done for ease of construction work associated with the Southern Interceptors Sewer.

On the 23rd of December 1999 the predicted early morning tide was 2.617mOD with a water level of 3.417mOD recorded at Ted Russell Dock. The atmospheric pressure was recorded at 1004mb. The predicted tide on 25ht of December 1999 as per Shannon Estuary Tide Tables was 2.617mOD Malin. The barometric pressure was recorded at 981mb. Atmospheric pressure has a significant influence on the water levels along with other factors such as wind speed / direction and river flows. Assuming the density of sea-water to be 1000kg/$m^{3,}$ a fall of 1 mbar in atmospheric pressure should support an elevation of almost 1cm in water level. The difference in atmospheric pressure would account for approximately 230mm of the difference in actual water levels recorded in both the above instances.

Other locations in Limerick are at a lower level and experience flooding regularly. Sir Harry's Mall, Westbury, Clancy's Strand and O'Callaghan's Strand flood almost biennially. At the Abbey River Limerick Main Drainage construction site there was extensive flooding of the cofferdams at Christmas 1999.

The River Shannon is the longest river in Ireland from its source, in Co. Leitrim, to its estuary, the river is 259km long and has a catchment area of 15,532km2. The total length is 344km from the source to Loop Head. Lough Derg is in the lower portion of the river. The water level in this lake is controlled by the power station at Ardnacrusha situated just to the North of Limerick. The daily discharge of fresh water into the Shannon rivers estuary is dependant on rainfall and the amount of water diverted through the Electricity Supply Board's turbines at the Ardnacrusha power station, which in turn depends on the public demand for electricity. In winter the demand for electricity is highest. The maximum flows also occur in winter. In winter at a time of high river flow when the headrace canal of the power station has reached capacity, the remainder of the flood water has to be released down to Limerick.

This prevents flooding upstream. There have been flows recorded of up to 817m3/s. The compensation flow (minimum flow) is 10m3/s in the summer. The large river flows in winter due to increased rainfall have an impact on water levels recorded. The winds in the region are variable both in magnitude and direction, but are predominantly from a Westerly and South-Westerly direction. A steady wind onshore causes a piling up of the sea against the coastline. In the estuary a steady wind in a Westerly or South-Westerly direction will have a large fetch (surface area of water upon which the wind may act). This causes a rise in the river water level at Limerick. An off shore wind reduces sea level. In this case an Easterly wind will act to lower the water level at Limerick.

The minimum design finished floor level is 4.5mOD which takes account of the unlikely coincidence of weather the river flows which give rise to the threat of flooding for residential properties.

10.5 Waste /Construction

Materials on site will follow the Reduce – Reuse – Recycle strategy. Where waste does arise it will be segregated.

- Timber products will be shredded and used as a mulch in landscaped areas.
- Plastics will only be removed as required and where appropriate returned to manufacturer or disposed of as refuse derived fuel (RDF) to a recycling contractor.
- Metal waste will be sent for recycling.
- Paints, the development is designed with a positive disposition toward self finish renders and coatings. Where waste will arise is from packaging these will be recycled.

10.5.1 Environmental Management during the Construction Phase

A number of measures will be incorporated into the scheme during the construction phase of the development to minimise the impact on the environment.

Machinery with a low inherent potential for the generation of noise or vibration will be used during construction. The timing of the site activities likely to create high levels of noise or vibration will be limited to minimise the impact potential.

A dust minimisation plan has been formulated to reduce the potential for dust generated on site to be carried to sensitive locations during construction.

A number of measures will be introduced during construction to minimise the potential of impact on the watercourses in the vicinity of the proposed development. These include:

- Erection of a temporary site fence to reduce the impact on the surrounding areas.
- Careful controls of cement or wet concrete, including washing out cement lorries off site.
- Storing fuel, oil and chemicals in an impervious secure bund.

An Archaeologist will be present to monitor the construction site during ground disturbance works. Construction traffic management measures will be employed throughout the construction and operation phases of the developments. These measures will assist in minimising any local adverse effects.

10.6 Construction Works

10.6.1 Construction Phase Run-off

The construction project will entail building adjacent to existing watercourse. The potential for water contamination during the construction phase would be associated with the following:

- Earth moving works;
- Temporary storage of oil and fuel for plant and equipment;

10.6.2 Earthworks

Earthworks will be required for the construction of the development. It is during this period that the potential for water pollution through excessive soil run-off and situation of the watercourses could arise. Care will be exercised during periods of heavy rainfall, when the erosion of exposed subsoils within construction areas is more likely.

10.6.3 Oil and Fuel Storage

Temporary storage of oil and diesel for plant machinery will be required for the duration of the construction period. All fuels will be stored in a secure bunded facility. The filling and take off points will be located within the bunded areas. The bunds will protect against accidental tank rupture and will ensure that any spilled oil can be retained for subsequent disposal to an appropriate outlet such as a waste oil recycler.

CHAPTER ELEVEN: CULTURAL HERITAGE

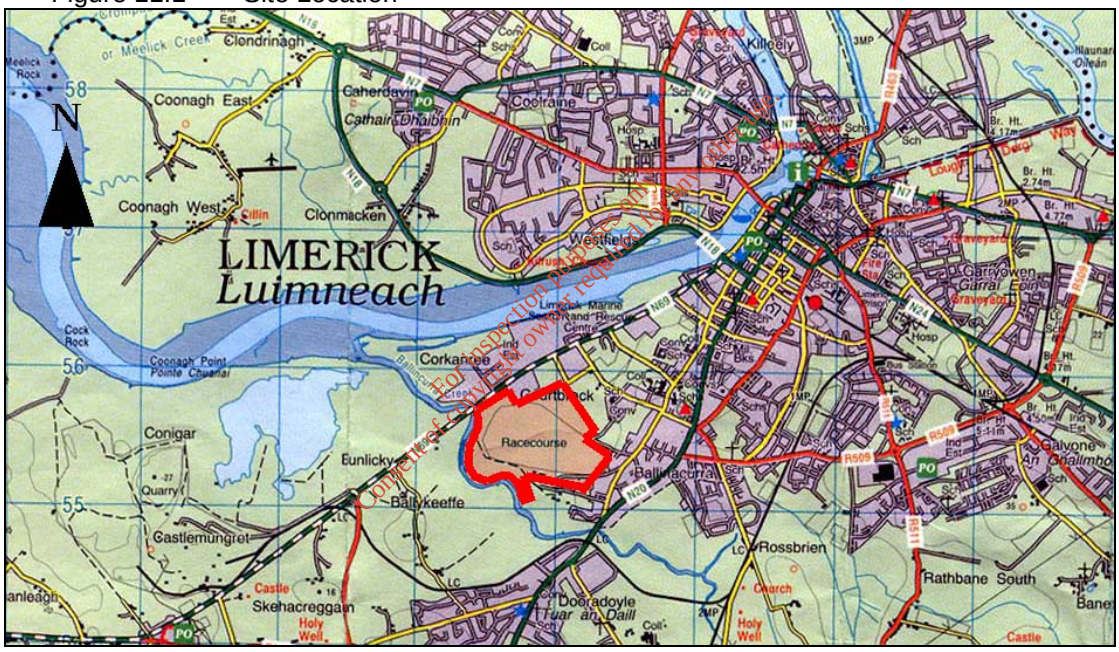
11.1 Scope

This report assesses the impact on the potential archaeological environment and potential architectural (cultural) heritage of the former Greenpark Racecourse in the townland of Ballinacurra (Hart) (figure 11.1). The proposed development is approximately 120 acres in extent and is to be undertaken on a phased basis.

The site was inspected on several occasions in September 2004. This report details the results of these inspections of the site as it stands to day (the existing environment), as well as a comprehensive historical background to the site, in order to consider it in its proper archaeological and architectural context. No intrusive archaeological investigations (test trenching or excavation) have been undertaken at this stage of the archaeological dimension to the project. Suggested further archaeological investigation (if appropriate) is stated at the end of the report.

This chapter assesses the entire site, and includes the section of the site which is subject to the withdrawn retail application.

Figure 11.1 Site Location



11.2 Method

The methodology for this chapter is outlined in Chapter 3.

The following abbreviations have been used in this report because of the different sets of feature types:

- RMP Recorded Monument and Place (a known archaeological site recorded by the Archaeological Survey of Ireland)
- PUA Potential Unrecorded Archaeology (areas that have the potential to have unrecorded features)
- PS Protected Structure

11.3 History of the Townlands

The proposed site for development is the former Limerick Racecourse at Greenpark. The proposed site is situated in the townland of Ballinacurra (Hart) and in fact takes up most of the area of that townland. The townland of Ballinacurra (Hart) is situated to the southwest of the city of Limerick. It is located in the barony of Pubblebrien and the parish of St Michael's (Townland Index 1982). Its area is almost 197 acres in extent.

Lewis writing in 1837 does make reference to the barony of Pubblebrien and the parish of St Michael's. However, he does not mention the townland of Ballinacurra (Hart) or any other features in the general vicinity of the townland (Lewis 1937). O'Donovan writing in the 1840s briefly mentions the townland and its divisions between the various family names (Hart, Weston etc.). Joyce (1995) records that the name of the townland comes from Beal Atha an Curragh, anglised to Ballinacurra. He believes that the name comes from a fording (crossing) point (now Ballinacurra Bridge, Dooradoyle Road) that was used by pilgrims in medieval times to travel from Limerick to the monastic town of Mungret several miles to the south. The Creek and the adjacent area was then named after this fording point (Joyce 1995, 85).

There are several Ballinacurra townlands in this area of Limerick, for instance Ballinacurra (Weston). It is likely that when the townlands were being first recorded in the 1840s, Ballinacurra was particularly large and so was divided into portions, which were named after the owners at that time.

It is not unusual that this townland is not mentioned specifically by either of the above commentators. While now quite close to Limerick City itself and connected to it by the Dock Road, at their time of writing the site was in a rural location in the hinterland of Limerick City. The Dock road had not yet been built and as such the townland was probably only accessible by foot or by the water channel Ballinacurra Creek, which is still extant. The first edition six-inch map dating to the early 1840s (see figure 11.7 below) shows the isolated townland as being prone to flooding (it notes floods across the townland) and as such prior to drainage was probably part of the floodplain of Ballinacurra Creek, which forms the southern boundary of the townland.

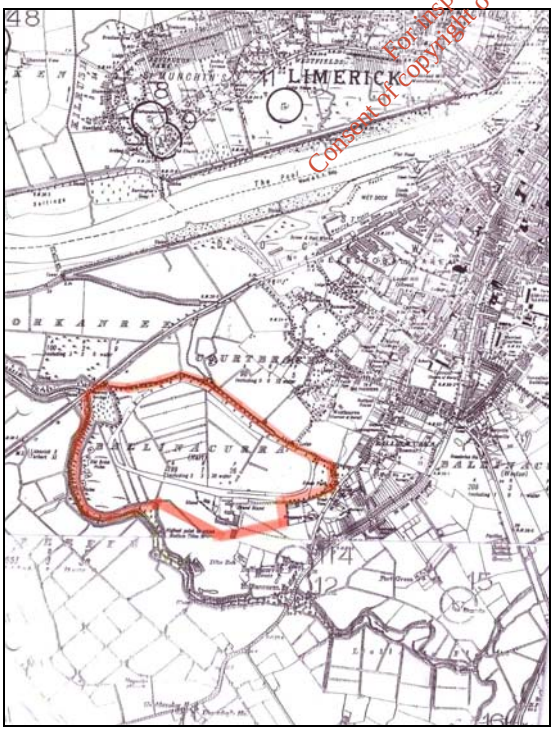


Figure 11.2: Portion of Record of Monuments and Places constraint map for Limerick showing proposed development site at Ballinacurra (Hart) Townland (red), sheet 5 and 13 (Archaeological Survey of Ireland 1997)

11.4 History of Surroundings

While the site in question is not in the core of Limerick and is well outside the zone of archaeological potential for the historic town (figure 11.2) due to the high archaeological importance of the town itself a brief sketch of the development of Limerick is provided. This illustrates how the town expanded to the southwest in the eighteenth century, which opened up areas such as Ballinacurra (Hart) to development, so that in the 1890s a racecourse was established there.

A history of the surrounding areas is included in Appendix C

With the increased wealth and prosperity of the city of Limerick and its expansion to the south and west with areas of warehousing and trade from the river, it is not surprising that along with this wealth, recreational activities were required. A racecourse was already established at Newcastle (southeast of the town in the area now known as Castletroy), but due to its poor and infamous reputation a new racecourse was established at Greenpark in the 1890s. Although not documented, the writers may deduce from the available evidence that this was likely to be the first development at the site at Ballinacurra (Hart) (see section 11.3).

Despite the fact that Greenpark racecourse is a very well known location in Limerick comparatively little has been documented about it. Spellissy has the most succinct history of the site and is summarised here. The course at Greenpark was established to replace the one at Newcastle and the first race was run there in 1868. Maurice Lenihan writing in 1866 of the earlier course at Newcastle said it attracted much attention, even from England and held many sporting events (1866).

The first chairman of the Limerick Race Company established for the Greenpark racecourse in 1890, was a member of the Barrington family, a very prestigious family at the time, after which Barrington's hospital was named.

Despite the fact that the races seem to have to have been moved from Newcastle to Greenpark in order to provide a venue for a more fitting manner "befitting of a civilised community" (resolution of Total Abstinence Association 1867 cited in Spellissy 1998), there was an incident at the very first race held there when the Limerick Chronicle newspaper reported that a faction fight began shortly after the start of the horse races, near the entrance and in the vicinity of what was known as the "Water Leap" (cited in Spellissy 1998). The location of this water leap is not known today, but it might be surmised that it was a jump along the course at some point.

It appears that the racecourse was named after "Greenpark House" that was situated on the western side of Southern Circular Road, to the southeast of the site. This house is marked on the six-inch ordnance survey map for the area, indicating that this house pre-dated the 1840s. This house is not a Protected Structure or an archaeological RMP. There is a house at present on this site named Greenpark House. The house appears to be modern in date, however it may incorporate earlier fabric. It is not within the zone for development and as such will not be directly impacted by the proposed development.

The course was also used for other events such as horse shows and trade fairs and even hosted GAA events prior to the construction of the Gaelic Grounds on the Ennis Road.

The racecourse at Greenpark was used twice in civic and religious occasions of national importance. The first was in 1963. On June 29th 1963 President John F. Kennedy on his four-day visit to Ireland, was received at Greenpark and conferred with the freedom of Limerick City. Pope John Paul II was received at Greenpark racecourse in 1979, October 1st. He too was conferred with the freedom of the City, as were several other notable churchmen (Spellissy 1998, 273-4).

11.5 Previous Archaeological Work

It appears that no previous intrusive archaeological works have ever been carried on or in the immediate vicinity of the proposed development site. A search of the Irish excavations database at www.excavations.ie was undertaken.

11.6 Information in Statutory Files

No information pertaining to Ballinacurra (Hart) or its immediate vicinity was found. Limerick City Museum has a number of artefacts and items relating to the racecourse at Greenpark (such as racing cards), which would be of historical rather than archaeological interest.

The Marine SMR (archaeological archive of ship and boat wrecks off the coast of Ireland) records one such boat wreck in the vicinity of Ballinacurra Creek:

Site Name Unknown
Date of Loss June 1832
Place of Loss Between Monsell's Creek and Ballinacurra Creek
This open sail boat was lost on the river. Three people were lost but four survived. (Freeman's Journal, Dublin, 16th June 1832, column "Fatal Accident")
(Marine SMR cited in O'Sullivan 2001, 326).

11.7 The Existing Environment

The Site at Present (figures 11.2 & 11.3)

The site at present is the abandoned remains of Greenpark racecourse. None of the grandstands and ancillary structures of the racecourse are extant. A modern concrete parade ring is situated in the south-western quadrant (the blue area), but is overgrown. There are two entrances to the site, one (the main entrance) to the northwest, off the Dock Road and the other to the south, off Greenpark villas, which appears to relate to Greenpark house.

The remainder of the site is covered in wet marshy ground, with a series of substantial drains crossing the site. The circular area of the course track is barely perceptible on the ground as a drier, higher area of grass, around a marshy interior. A large modern corrugated cattle shed is situated to the south of the site, but beyond the proposed development zone.

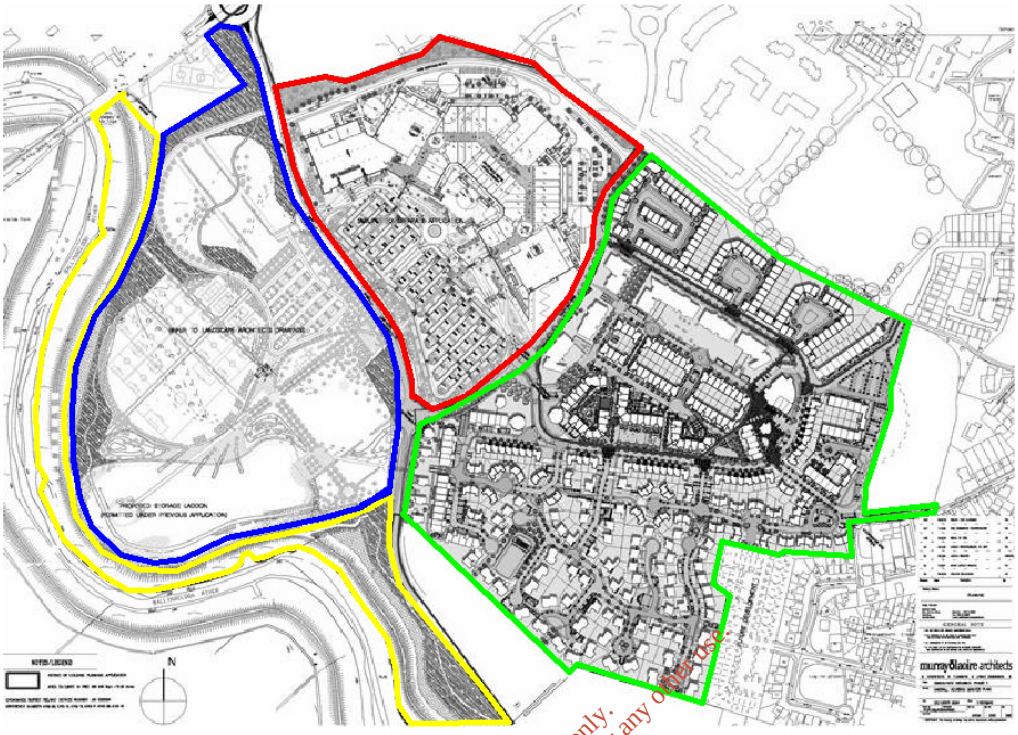
The site itself is bounded to the north by the buildings and a halting site facing onto the Dock Road, to the west through south by Ballinacurra Creek, and to the east by a substantial tree lined boundary, which is also a townland boundary.

As stated previously, it appears that the first development of this site was the racecourse in 1868. From the first edition six-inch ordnance survey map of the area it shows that most of the site was part of a floodplain for Ballinacurra Creek, which is a tributary of the River Shannon. The confluence of these two rivers is less that a kilometre to the northwest of the site in question.

Ballinacurra Creek is crossed by a bridge on the Dock Road, immediately to the north west of the site. This bridge is a modern construction and called Bawney Bridge. The origin of this name could not be established during this study. It is not to be impacted by the proposed development.

11.8 Field Inspection

Figure 11.3 – showing zones used in text



For ease of description the site has been divided into three distinct areas: Blue, Green and Red, representing proposed amenity, residential and commercial zones of the development respectively.

It will be noted from the plans provided that the permitted road is located on the drawing bisecting the site in a general north-south direction. It diverges from the Dock Road via a proposed roundabout adjacent to the modern Roche's Feeds. This road and roundabout were permitted under a previous application. As such this road is beyond the scope of this study and is not referred to in subsequent sections.

The area to the south of the site proposed for development is the right embankment of Ballinacurra Creek. This is an embankment (amended in modern times and approximately 5m in height) with a berm between it and the water's edge. This river is tidal and a tributary of the River Shannon, converging with it less that a kilometre to the northwest of the site. This area is a special area of conservation, due to its habitat and flora and fauna. Water fowl and reeds are still plentiful in this area. In fact the reeds are still harvested for weaving and thatching on a regular basis and had just been gathered during the site visit. As such the area coloured yellow on figure 11.3 (from the eastern edge of the embankment and including the embankment itself as well as the berm and water channel) has been excluded from this walkover as it is exempted from the development (however it will be discussed from an archaeological view point in section 11.9; plates 11.21-11.23)

It is also to be noted that the field inspections were carried out in September 2004. This is not an optimum time of year to carry out such inspections, as vegetation growth is still high and may mask low-lying potentially archaeological and/or architectural features. As such, the high growth of vegetation on the site was a limitation to this study. All boundaries of the site and all the large drains on site were inspected by the writers.

The "Blue" Area (Recreational/Amenity zone) (Figure 11.4; Plates 11.1-11.5, 11.15, 11.16)

This area is situated in the western portion of the site proposed for development. It is bounded to the west and south by the meandering Ballinacurra Creek. This water channel and embankments are a Special Area of Conservation (SAC) and as such is excluded from the proposed development works (it is indicated in yellow on figure 11.5). This area is zoned as amenity.

The area is accessed through a modern entrance from the Dock Road to the north of the site. From the site inspection it is clear that the northern portion of this area has been filled with imported material, raising its level by approximately 1 metre in places. A tarmaced haul road provides access through the Blue area and is orientated north to south through the area. This road runs parallel to the river embankment for a time, from which it then diverges. It continues through the Blue area to where the racecourse stands once stood and then continues southwards into the Green area, to an entrance at the south of the site (described in green area below). The only extant remains of the buildings of the racecourse is a small modern concrete parade ring and several hardstand areas. These are on the highest part of the site, and provides a good view of where the original racetrack was situated, which is a logical arrangement.

This road appears to be modern but may have replaced an earlier road. It is not marked on any of the mapping for the site and so it is suggested that it was a localised access track for use by the racecourse.

The vegetation cover of the blue area varies from wettish marshland, (particularly in its south western part, nearest the embankments to the river, to small copses of trees such as birch and hazel. It was noted during the inspection that a lot of "fly-tipping" of rubbish and white goods, was being undertaken at this site.

The central and eastern portions of the blue area originally formed part of the racecourse proper and in places the original track could just be perceived in the long grass. Several large drains are also extant and these relate to the continual draining of the land while it was used as a racecourse. This entire area was walked by the writers and nothing archaeological or architectural in nature was discovered.

Figure 11.4: Location of the "Blue Area", zoned as open space

The "Green" Area (Residential zone) (Figure 11.5; Plates 11.6-11.10)

The green area of the proposed development is zoned as General Purpose. This area is situated in the southern part of the area proposed for development. It is bounded to the south by existing houses (including Greenpark house which faces onto South Circular Road), to the east by a field boundary (which is also a townland boundary), to the north by the "red area", though divided from it by a deep drain, and to the west partially by the blue area and by land not included in this proposed development.

The eastern boundary was inspected for anything of potential archaeological or architectural merit. Nothing was discovered during this inspection. The boundary is predominantly earthen with some stone in places and is covered with dense vegetation and several very large trees.

This "green" area is generally not as marshy or wet as the blue area. This area also contains half of the original track. This can be perceived on the ground as better quality grass in a curving strip, surrounding much more rough and marshy ground. Several small walking tracks can be noted in this area and it is a popular place for walks. It is proposed that the line of the track be incorporated into the new residential development.

Modern infilling with imported material has been undertaken in the western portion of the green area.

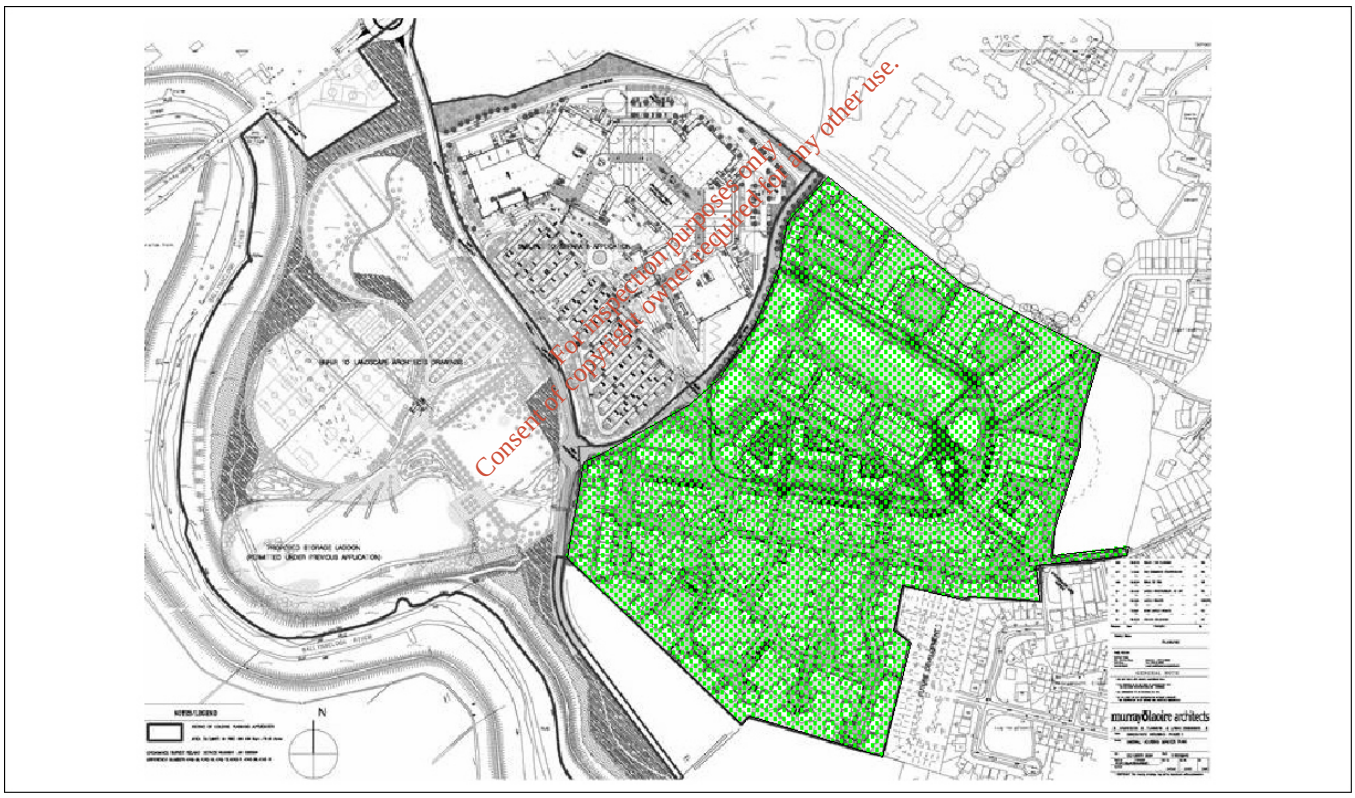


Figure 11.5: Location of the "Green Area", zoned as general purpose

The "Red" Area (Figure 11.6; Plates 11.11-11.14, 11.17, 11.20)

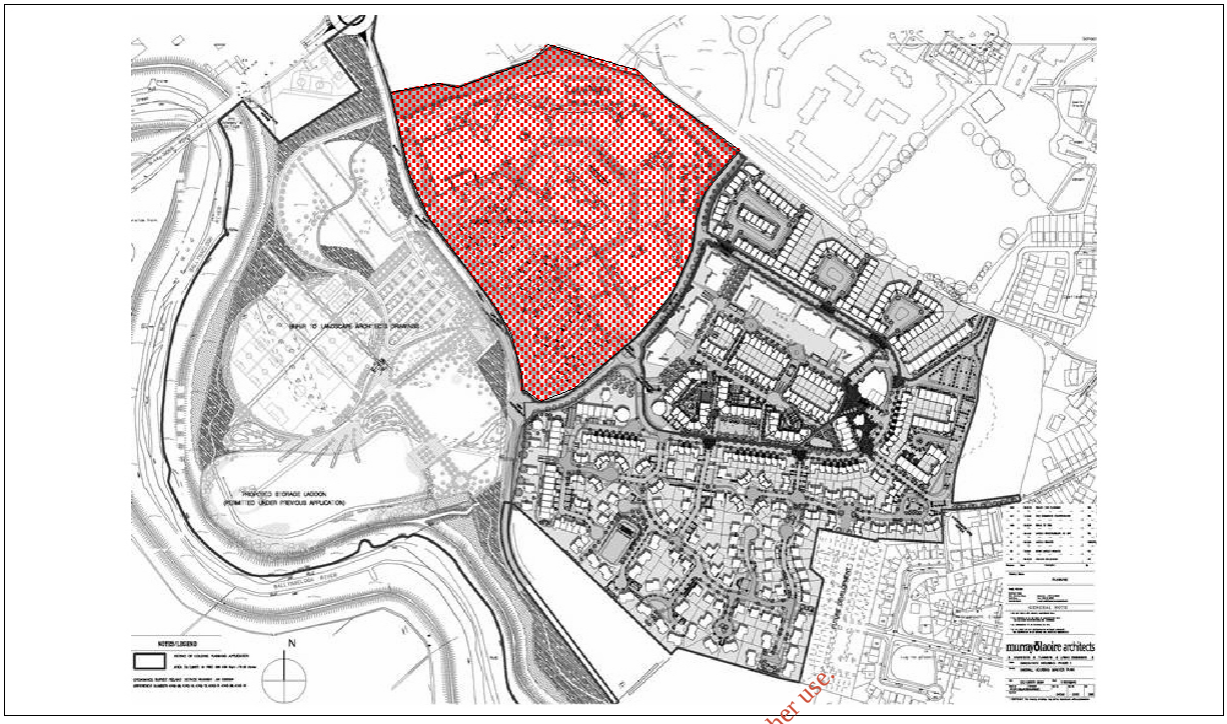


Figure 11.6: Location of the "Red Area", zoned as general purpose

The red area of the site refers to the lands subject to the withdrawn retail application.

The red area is situated in the north-eastern part of the proposed area of development. It is bounded to the north by a business, which faces onto the Dock Road (Roche's Feeds), to the west by the blue area, to the south by the green area (though divided from it by a large drain) and to the east the townland and field boundary (described above).

The area of the proposed development is very similar in character to the green area. Again the location of the track can be perceived around the perimeter of the red area, with much more marshy ground in the interior. This interior is also crisscrossed with several large drains. Infilling with imported material has also occurred in the western portion of this area. It can also be noted that the adjacent property Roche's Feeds has been raised about 1.5m before construction. While nothing of archaeological or architectural potential was noted on the ground during the field inspection, a potential feature was noted during the analysis of the aerial photographs, in particular the coastal survey images (see section 11.12).

In summary, the field inspection walkover did not discover anything of archaeological or architectural potential. The SAC was excluded from the inspection, as it will not be impacted by the proposed development. The long linear drains on the site were interpreted as modern and associated with the site when it was used as a racecourse. These drains are no longer maintained and it can be seen that in places the land is reverting back to its original state as wet/marshland. It is noted that on the first edition six-inch map dating to the 1840s that the site is marked "floods" and was probably a floodplain for Ballinacurra Creek.

Despite the fact that potential features were not discovered during the field inspection, the site should still be considered to be of high archaeological potential due to a number of other factors, such as the aerial photograph evidence and its situation adjacent to Ballinacurra Creek, a major tributary of the Shannon in this locality (further discussed in section 11.12).

11.9 Archaeology Plates

Plate 11.1: Blue area site from south along haul road (SAC on left)

Plate 11.2 : Blue area from SAC embankment looking south

Plate 11.3: Blue area, southern area from north

Plate 11.4: Blue area from south

Plate 11.5: Blue area, parade ring from east

Plate 11.6: Green area southeastern side from northwest

Plate 11.7: Green area gates and pillars from Greenpark Villa road, from northwest

Plate 11.8: Green area old racetrack from southwest

Plate 11.9: Green area old racecourse from northwest

Plate 11.10: Green area from north, note fill

Plate 11.11: Red area from south, note fill and Roche's feeds on Dock Road

Plate 11.12: Red area from northwest

Plate 11.13: Red area lateral drain

Plate 11.14: Red area from west

Plate 11.15: Blue area, imported material from southeast

Plate 11.16: Blue area, looking northwards towards Bawney Bridge

Plate 11.17: Red Area, Roche's Feeds and Racecourse from south

Plate 11.18: Red area from north

Plate 11.19: Red area eastern townland boundary from north

Plate 11.20: Red area, looking southwest towards location of stands

Plate 11.21: Location of Bawney Bridge, Dock Road from east

Plate 11.22: View of Ballinacurra Creek from Bawney Bridge, from north

Plate 11.23: View of RMP LI013-114--- Ballinacurra House, from east

11.10 The Proposed Development (figure 11.3)

The proposed development entails three distinct zones: commercial, residential and amenity (represented in this study by red, green and blue areas respectively). The area marked in yellow is an SAC around Ballinacurra Creek and is as such excluded from this proposed development.

While this study provides for the entire development area, the development will be conducted on a phased basis.

11.11 Archaeological and Architectural Heritage

This section describes the archaeological and architectural features present within and immediately adjacent to the proposed development site. It also describes areas of high archaeological potential and archaeological sites in the immediate vicinity of the proposed development area, though outside it, in order to put it in its wider archaeological context (figures 11.7-11.10).

11.12 Cartographic and Aerial Photographic Evidence

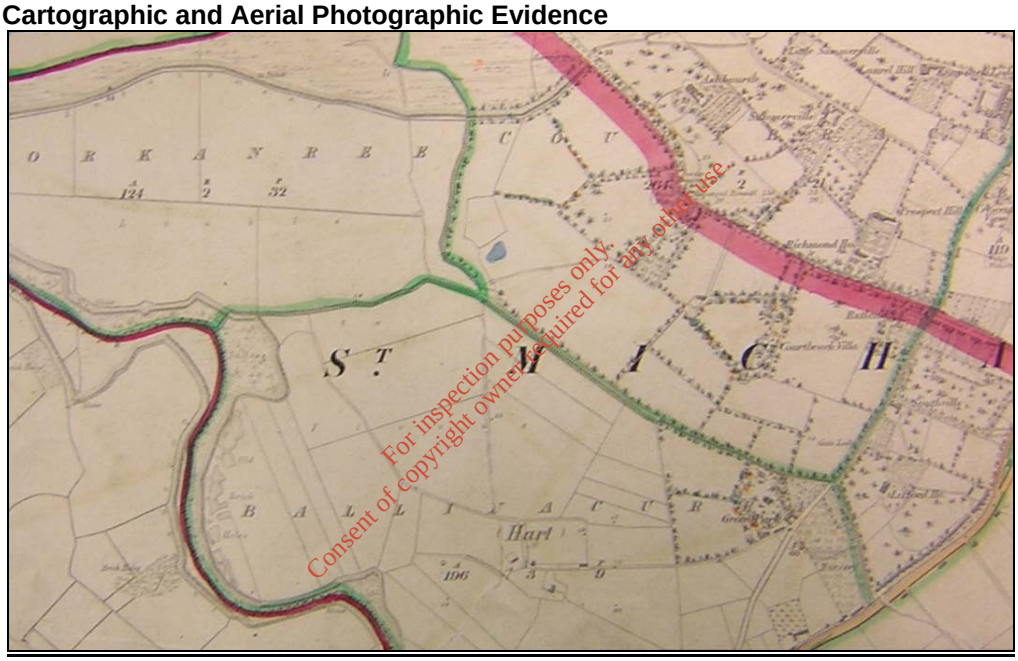


Figure 11.7: 1st edition six-inch map showing portion of site dating to c.1840s (sheet 5)

While there are several early cartographic map representations of Limerick city dating from the sixteenth century, the site in question is not marked, as it is some distance from the core of the historic town. The map illustrated in figure 11.7 is the first edition six-inch Ordnance Survey map for the site, dating to the 1840s. While there are many more fields than today, it has not changed extensively. Greenpark house is noted to the southeast of the site in question, which is surrounded by trees at that time. The townland boundary of Ballinacurra is also marked with trees and appears not to have changed in the intervening centuries. The course of Ballinacurra Creek, which forms the western and southern boundary to the site, is also shown. It appears not to have embankments at this time so it can be deduced that these were a later addition to the site, perhaps when it was used for the racecourse (c.1860s).

Several features are marked on this map where the embankments are located. These are called “Old Brick Holes” on the map. It is suggested that these refer to areas where the alluvial muds and estuarine clays beside Ballinacurra Creek were extracted to manufacture bricks. These may have just been holes dug by hand to extract the clay and as such may have left little trace behind. They were not identified during the field inspection and it is probable that their site is covered by the present embankment.

An important point to note from this map is that fact that the site is marked as “floods”. In essence this means that the site land was probably part of the floodplain for Ballinacurra Creek. The many drains now present on the site would also suggest that it was once a wet marshy place. Indeed now that the drains are no longer maintained much of the site is reverting back to this wet/marshy environment, with much of the vegetation being reeds *etc.*

An aerial photo (figure 11.8) of most of the site was obtained and analysed for the purposes of identifying potential archaeological features, which may be difficult or impossible to identify during the field inspection. The aerial photograph, taken from about a height of 3000 feet was examined in detail prior to and after the final field inspection. This photograph was first analysed in the office, and any possible anomalies or features were then examined on site. The photograph is relatively free of cloud shadow, with long shadows visible on the ground cast by trees, poles and buildings.

This photo showed a number of possible features but when analysed on the ground appeared to represent differential vegetation growth. This photo is particularly good at showing how the racecourse at Greenpark looked when it was in use. The maintained drains are very obvious. From inspecting the site it must have been quite difficult to have kept the site dry enough for races to take place there due to its natural marshy state.

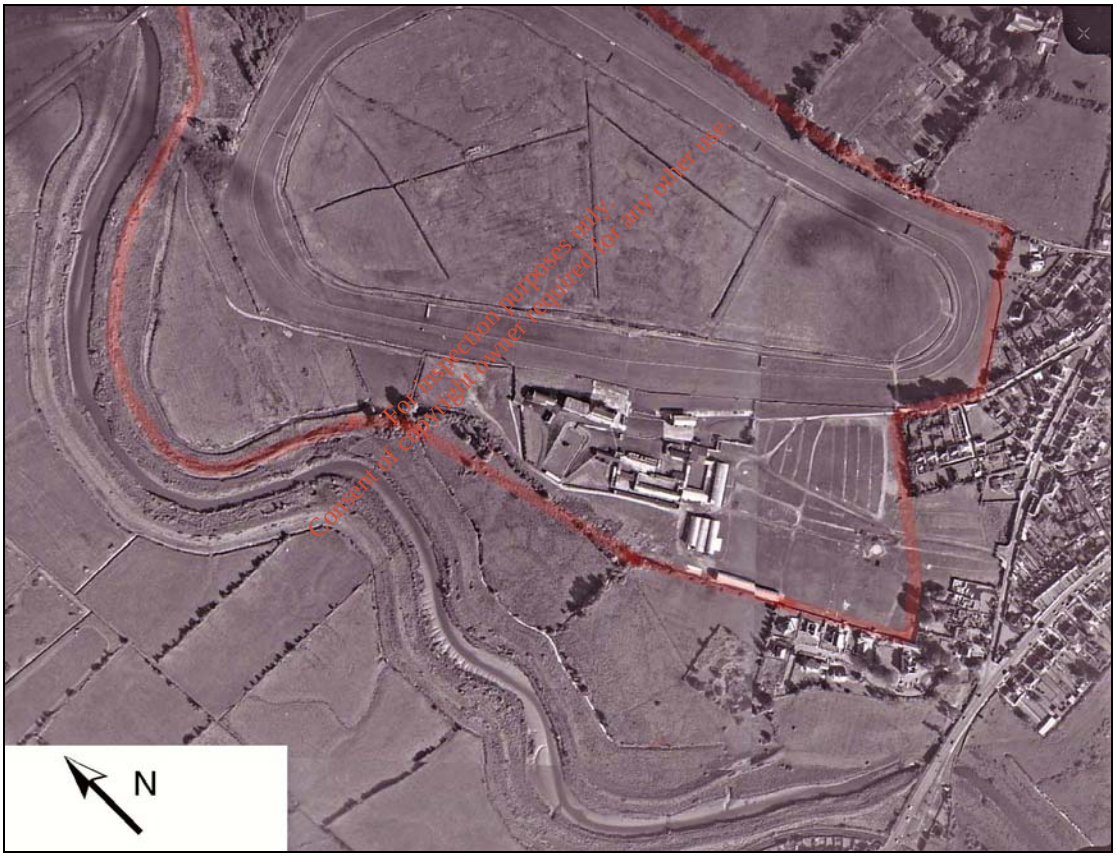


Figure 11.8: Aerial View of Site (marked in red) showing RMP sites. Original photos Black and White, medium flown dating late 1980s/early 1990s

Another aerial photograph of the site was also analysed. Due to the site’s proximity to Ballinacurra Creek, a tributary of the Shannon, the National Coastal Survey (1995, cd number 5), actually included the site. This survey includes near vertical aerial photographs of the coast of Ireland on a county basis, taking using infrared technology.

From analysing this photo (figures 11.9 and 11.10) a potential archaeological feature- a circular enclosure approximately 50m diameter was noted in the “red area” of the proposed development. Despite locating this feature on the photo, it could not be identified on the ground, despite extensive searching by the writers. It may be that this site is differential

vegetation growth or a wetter area, however due to its very regular circular shape, it must be treated as having very high potential to be an archaeological feature and as such is treated as a potential unrecorded archaeology (pua) in this study.

Figure 11.9: National Coastal Survey (number 5) north to bottom left, site partially visible at centre top

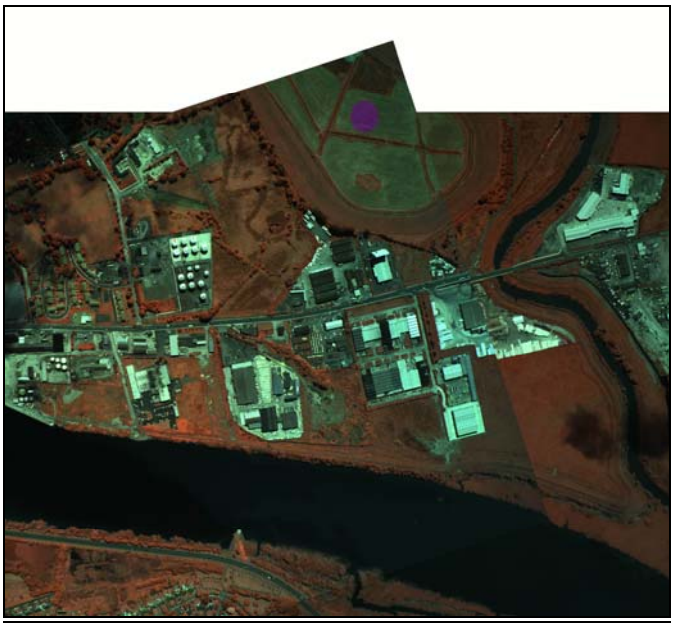


Figure 11.10: Blue circle showing location of potential unrecorded archaeological site (pua), as seen on coastal survey figure 11.9

11.13 Recorded Monuments and Places (RMPs) (figure 11.2)

The RMP constraint map and list were consulted for this study (portions of sheet 5 and sheet 13). There are no RMPs within the zone proposed for development. The historic town of Limerick's zone of archaeological potential is over 1km to the northeast of the site. The closest RMP sites to the proposed development site are: LI013-0114--- and LI013-012---, Ballinacurra House (country house) and Ballinacurra Bridge (fording point). They are several hundred metres from the south-eastern boundary from the site and as such will not be directly or indirectly impacted by the proposed development. Ballinacurra House is still used as a residential and commercial accommodation. Ballinacurra Bridge is still in use as a bridge crossing over the Creek on the Dooradoyle Road. It is recorded that this bridge may have replaced a fording point on Ballinacurra Creek that was used since medieval times when pilgrims travelled to the monastery at Mungret from Limerick (Joyce 1995, 85).

11.14 Potential Unrecorded Archaeology (PUA)

As stated, while during the field inspection on the ground nothing of archaeological or architectural potential was noted this might have been due in part to the overgrowth nature of much of the site. From the aerial photo analysis one potential archaeological feature was noted in the "red area". From the photo it appears as a regular circular enclosure approximately 50m in diameter (figures 11.9 and 11.10). This features although quite clear on the aerial photo could not be deciphered on the ground.

Due to the proximity of the site to Ballinacurra Creek, a major tributary of the River Shannon and the fact that this site was once the flood plain of the Creek the area does have the potential to yield archaeological features and/or archaeological objects.

11.15 Protected Structures and the Proposed Development Area (PS)

There are no Protected Structures on or in the immediate vicinity of the proposed site of development (Limerick City Draft Development Plan 2004).

11.16 Unrecorded Architectural Features (UAF)

The only architectural feature noted during the field inspection was the gates and pillars at the southern entrance to the site off Greenpark Villas road. It is unlikely that the site would yield further architectural features of interest in situ, due to the site's primary use as a racecourse. Those structures have been removed. All that remains is the small parade ring, which is constructed of concrete and as such is modern.

11.17 Historical Events

Two events of national importance to Ireland occurred at Greenpark Racecourse in recent history. The first was the reception of President John F. Kennedy President of the U.S.A. in June 1963. The second was the visit by Pope John Paul II to Limerick on October 1st 1979. The Pope also visited Dublin at the Phoenix Park, the Marian shrine Knock, Galway City at Ballybrit and the Early Medieval monastic site at Clonmacnoise on the River Shannon. The site at Greenpark Limerick is the only site visited by the Pope not to have a memorial to this historic event. Neither does it have any memorial to the visit of John F. Kennedy.

11.18 Potential Archaeological Site Types at Greenpark

Despite the fact that no potential archaeological features were identified during the inspection, it is likely that the vegetation cover limited their discovery. The fact that the site is very close to a major tributary of the River Shannon, Ballinacurra Creek and that prior to embanking was part of the floodplain for that water channel, the site certainly has the potential to contain several different archaeological site types subsurface. These would include fulachta fiadh (burnt mounds), trackways, wooden or log boats. An extensive archaeological intertidal survey

of the estuary of the River Shannon and its major tributaries has been undertaken by O'Sullivan (2001). This study produced archaeological remains stretching from the Mesolithic and Neolithic periods (submerged forests, red deer bones and occupation evidence in the intertidal zone), The Bronze Age (House and trackway) the medieval period (fishtraps), through to the post medieval period (fishtraps, shipwrecks, harbours and lighthouses).

As such, while the site in question is now separated from Ballinacurra Creek by an embankment, they have to be seen in their original context when the proposed development site was part of the Creek's floodplain (and to a certain extent its intertidal zone).

The identification of a potential circular enclosure on one of the aerial view of the site might be suggested as a ringfort, although its approximate dimensions of 50m in diameter might show that it is too large to be a ringfort. While the floodplain of a water channel is an unusual place to situate a ringfort, parallels for this location can be found. Further upstream of Ballinacurra Creek (some distance to the east of proposed development) in the townland of Ballinacurra (Weston) an enclosure is marked as an RMP LI013-015---, which is located in the floodplain of the Creek. In fact there are hundreds of archaeological enclosures close to water channels that have not been definitely classified as yet due to lack of archaeological excavation of these site types. Due to the original wet/marshland of the site it also has a very high potential for fulachta fiadh.

11.19 Fulachta Fiadh

A fulacht fiadh will normally manifest itself as low, grass covered mounds, which may be horseshoe shaped, crescentic, and rounded or oval in appearance. The mound usually consists of burnt or fire cracked stones with a high proportion of ash and charcoal, resulting in the covering soil usually having a blackened appearance. Excavation may reveal a trough area, which can be constructed of timber, clay or may be stone lined. This acted as the water receptacle, where stones were placed after being heated in a fire. The heated stones then raised the temperature to boiling point. As the stones cooled, they cracked, being eventually removed and dumped beside the trough. Repetition of this process eventually led to the creation of the burnt mounds recognised today as fulachta fiadh.

These sites are commonly found in marshy or wet ground or in places that were once wet, but have been reclaimed. As such, there us a likelihood that these site might be present, in an albeit disturbed state in the site in question.

11.20 Enclosures

Ringforts are usually small circular enclosures, diameters averaging 30m, with an earthen bank and external ditch, with the ditch providing the material for the bank. More elaborate sites may have several banks and ditches (Aalen et al. 1997, 44). In those areas where the soil cover is shallow or not present, stone enclosures are built and are known as 'cashels' (ibid.) and do not normally have an associated outer ditch (O'Sullivan and Sheehan 1996, 134).

Ringforts are one of the most ubiquitous archaeological monuments in the country and their original number is estimated at being in the region of forty thousand examples (O'Kelly 1970). They are the primary record of early medieval settlement in Ireland, which was essentially rural (Edwards 1990, 6). Ringforts would have sheltered animals and an extended family or 'kin-group' or wealthy farmers and are sometimes viewed as 'farmsteads' (Mytum 1992, 102). They are sited in a variety of landscapes but most commonly on upper slopes, situated near fertile land. Most tend to date from 500AD to 1000AD, (Stout 1997, 24) although some argue for a Pre-Christian origin (O'Riordain 1940) while more postulate on a post-medieval construction (Rynne 1964). However, it is the view that this dating is incorrect due to the misinterpretation of stratigraphic sequences (O'Conor 1998,90).

There is usually one entrance into the circular enclosure, the position of which may be identified where a gap in the bank corresponds with a causeway across the ditch (O'Sullivan and Sheehan 1996, 134). Studies have shown that the orientation of the entrance into the fort was standardised to a certain degree, usually being located in the east to south-eastern

quadrants of the fort, regardless of the lie of the land. This has lead many scholars to the conclusion that this orientation is due to the prevailing winds, which come from the south-west (Stout 1997, 19).

From excavated examples, it appears that the interior of a typical ringfort would have contained both sheds for animal husbandry and houses for habitation. It seems that the earliest structures of the ringfort were circular in plan, with later ringforts having rectangular houses (Stout 1997, 32). Indeed, a study on the archaeological structural evidence that has been excavated, which was carried out by Lynn (1986), concluded that the primary house type was circular and that many of the rectangular houses actually post-dated the ringfort phase of activity.

Strangely, many ringforts have higher ground overlooking them, which may indicate that 'ring-fort' is in fact a misnomer for this monument (Edwards 1990, 20 and Stout 1997, 19). Mallory and McNeill have studied ringforts defensively and have come to the conclusion that they could not have been for defence and that they were certainly to establish a social elite in that society (1991).

Some excavated examples of ringforts have produced little if any archaeological evidence of occupation. It seems unlikely that a bank and ditch enclosure would have been built and never used, and so some other practice must have been occurring. Some scholars believe that these ringforts functioned as cattle enclosures (Lucas 1989). From the documentary sources it does show that cattle were a very important part of early medieval life. From an archaeological point of view, many ringforts occur in two or more (Monk 1998, 35-52), which might suggest that one was used for habitation with another functioning as a cattle pen (Stout 1997, 93).

While it is not conclusive that the site identified on the aerial photo is archaeological, its regular circular shape would suggest that it is. Its approximate diameter of 50m might suggest that it is a different sort of enclosure to a ringfort, but may nevertheless by early medieval in date (archaeological excavation is producing many enclosures that are this date but not ringforts in the strict sense for instance that at Newtown Co. Limerick Coyne 2001).

11.21 Potential Impact of Any Proposed Development

This section might be more accurately described as the prediction of impacts on the cultural heritage, including archaeology, since the impacts by definition have not yet occurred (EPA 1995a, 23; 2002).

11.22 The "Do-Nothing" Impacts

If nothing is done on this site the potential archaeological and architectural features will remain in an undisturbed state and will not be impacted.

11.23 The Predicted Impacts

The description and evaluation of the predicted impacts are overleaf:

Impact Number 1

Character: The development of "Blue Area" (amenity)
Magnitude: Entire area
Duration: Permanent (in excess of 60 years)
Consequences: Potential loss of unrecorded subsurface archaeological features and/or objects due to the development of the area
Significance: significant
Certainty: possible

Impact Number 2

Character: The development of "Green Area" (residential)
Magnitude: Entire area
Duration: Permanent (in excess of 60 years)
Consequences: Potential loss of unrecorded subsurface archaeological features and/or objects due to the development of the area and impacting on track of Greenpark racecourse
Significance: fairly significant
Certainty: Definite

Impact Number 3

Character: The development of the "Green Area"
Magnitude: Entire area
Duration: Permanent (in excess of 60 years)
Consequences: Potential loss of architectural feature of the gateway and pillars
Significance: Significant
Certainty: Probable

Impact Number 4

Character: The development of the "red area"
Magnitude: Entire area
Duration: Permanent (in excess of 60 years)
Consequences: Potential loss of unrecorded subsurface archaeological features and/or objects due to the development of the area. The direct impact on the potential archaeological enclosure as shown on Figures 11 and 12, by its destruction.
Significance: significant
Certainty: possible

Impact Number 5 VISUAL

Character: The development of the entire site
Magnitude: Entire area
Duration: Permanent (in excess of 60 years)
Consequences: Visual impact of development from and to adjacent RMPs
Significance: Not Significant as this area is not visible from the nearest RMPs LI013-114--- and LI013-12---. In any case this area is already in an area that is built-up, so visual impacts has previously occurred
Certainty: Definite

Impact Number 6

Character: The development of the entire site
Magnitude: Entire area
Duration: Permanent (in excess of 60 years)
Consequences: Loss of the historical context of the site, and loss of public consciousness of visit of J.F.Kennedy and Pope John II, loss of townland name and loss of Greenpark name
Significance: Very significant

Certainty: Definite

11.24 The "Worst Case" Scenario

Should any proposed development be carried out with no archaeological or cultural heritage mitigation measures, there is a high possibility that archaeological material and data may be lost.

11.25 Interaction of Impacts

It is important to realise that the proposed development's impacts relating to different disciplines (such as the ones listed above for archaeology and cultural heritage), may have parallel impacts in other disciplines, such as visual, noise or public health impacts which have not been specifically addressed here. Therefore this report should be considered in view of the other impacts studied elsewhere.

11.26 Conclusions and Suggested Mitigation

The site in question as assessed in this report has two features highlighted one of which is of possible archaeological interest (enclosure on aerial photo) and the other of architectural interest (the gate and pillars). From an archaeological point of view, based on previous survey results from similar topographical regions on the River Shannon (O'Sullivan 2001) the site in question has a high archaeological potential, to reveal unrecorded archaeology subsurface. In light of this and the overall assessment, it is suggested that any proposals for the development of the site considers this assessment. Therefore the writers suggest the following in order to mitigate against the above predicted negative impacts (see below).

It is important to note that it is the National Monuments Section (NMS formerly Dúchas) sometimes through the local authority, who will formulate and ratify any archaeological mitigation, should it be required and this report can only make suggestions and report on the desk top study and site inspection carried out. The NMS may recommend all or some of the suggestions made below. The mitigation suggestions are based on mitigation that has been used in similar projects. However, it may also recommend mitigation that has not been included here.

Number	Mitigation Measure	Mitigates against predicted impact number ….
1	Due to the high potential of the site to yield previously unrecorded archaeological features and/or artefacts and the overall size of the development, it is suggested that archaeological test trenching be undertaken in advance of the commencement of each phase of the development to further ascertain if there is archaeological remains subsurface. Should archaeological remains be discovered further archaeological mitigation would be required to deal with it (through NMS)	1, 2 & 4
2	The gate and pillar features at the end of Greenpark Villas Road be retained or if this is impossible, reuse of the feature elsewhere in the development	3
3	That targeted archaeological test trenching be undertaken at the site of the potential archaeological enclosure (as shown in figures 11 and 12). Should it prove to be archaeological, preservation in situ, or excavation by hand (termed preservation by record) may be required (NMS to ratify any subsequent mitigation)	4
4	In order to maintain some of the historic integrity of the site and its connection to its past, it is suggested that the townland and Greenpark names be used in some form in the new development. It is also suggested that the events of National Importance- the visits of J.F. Kennedy and Pope John Paul II, be remembered in some fashion in the new development. Arrangements for these might be agreed with the local authority.	6
5	The proposed development in the “green area” zoned residential is proposed to incorporate some of the original route of the track at Greenpark Racecourse, again to maintain the site’s historic integrity	2
6	Due to the size of the development and the subsequent results of the archaeological test trenching, archaeological monitoring at construction phase may be required	all

CHAPTER TWELVE: EFFECT ON THE ENVIRONMENT - NOISE & VIBRATION

12.1 Introduction

This chapter assesses the entire site, and includes the section of the site which is subject to the withdrawn retail application.

This report will assess the potential noise and vibration impacts associated with the development on the noise-sensitive locations surrounding the site. Typical noise sources associated with the proposed development will be short-term construction noise and, once developed, additional vehicular traffic on public roads, car parking, deliveries to the site and building services noise.

The chapter outlines the receiving environment of the entire site before assessing the potential impacts, of any, of both the residential and retail schemes individually.

12.2 Receiving Environment

12.2.1 General Description

The proposed development site is located between the Dock Road and the South Circular Road to the south west of Limerick city, Co. Limerick. The site is bordered to the east by a number of established and newly constructed residential estates, to the west by the N69 Dock road, to the north by a number of residences and the dock road industrial estate, while the Ballynaclogh River runs close to the southern perimeter of the subject lands. The lands to the west and northwest of the site are classified as developed industrial/commercial lands, while those located to the north and east of the site are of a residential nature. To the south of the site, the lands are undeveloped greenfield comprised of wet marshes, wet grasslands and the Ballynaclogh River.

The nearest noise-sensitive locations to the proposed commercial/retail development are residential dwellings located beyond the northern and eastern boundaries.

12.2.2 Environmental Noise Survey

An environmental noise survey was conducted in order to quantify the existing noise environment. The survey was conducted generally in accordance with ISO 1996: Acoustics – Description and measurement of environmental noise: 1982. Specific details are set out below.

12.2.3 Choice of Measurement Locations

Three measurement locations were selected; each is described in turn below and also shown on Figure 12.1 at the end of the chapter.

Location 1 is within an existing residential estate at Greenpark Close located to the south of the proposed development site

Location 2 is within an existing residential estate to the east of the proposed development site.

Location 3 is located to the north of the proposed development site along the Dock Road at a point near to the entrance to the development site.

12.2.4 Survey Periods

For the purpose of this document daytime is taken to be between 07:00hrs and 23:00hrs, whilst night-time is between 23:00hrs to 07:00hrs. Noise measurements were conducted over the course of two survey periods as follows:

- Daytime – 14:55hrs to 18:00hrs on 25/07/2004;
- Night-time – 23:05hrs on 27/07/2004 to 02:00hrs on 28/07/2004.

The daytime measurements cover a typical period that was selected in order to provide a typical snapshot of the existing noise climate.

The night-time period provides a measure of the existing background noise levels.

The weather throughout the daytime survey was dry and calm with air temperature in the order of 20°C and windspeed was less than 2m/s. Temperature during the night-time period dropped to around 10°C and windspeed was in the order of 1m/s.

12.2.5 Personnel and Instrumentation

Louis Smith (AWN) conducted the noise level measurements during both daytime and night-time periods.

The noise measurements were performed using a Brüel & Kjær Type 2260 Sound Level Analyser. Before and after the survey the measurement apparatus was check calibrated using a Brüel & Kjær type 4231 Sound Level Calibrator.

12.2.6 Procedure

Manned measurements were conducted at four boundary locations on a cyclical basis for sample periods of 15 minutes. The survey results were noted onto a Survey Record Sheet immediately following each sample, and were also saved to the instrument memory for later analysis where appropriate. Survey personnel noted the primary noise sources contributing to noise build-up.

12.2.7 Measurement Parameters

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

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

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

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

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

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

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

12.2.8 Results and Discussion

Location 1

The results for Location 1 are summarised in Table 12.1 below.

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	14:55 – 15:10	49	72	35	47	39
	16:01 – 16:16	44	70	34	43	37
	17:45 – 18:00	48	76	35	50	37
Night-time	23:05 – 23:20	36	48	30	38	33
	00:10 – 00:25	41	59	30	39	32
	01:07 – 01:22	33	48	27	35	30

Table 12.1 Summary of Measured Noise Levels at Location 1

During the daytime, the dominant source of noise was road traffic on the surrounding roads. Construction noise was also occasionally audible from a nearby site. Noise levels were in the range of 44dB to 49dB L_{Aeq} and 37dB to 39dB L_{A90}.

During the night the dominant source of noise was again road traffic however the amount of road traffic on the local network had reduced. Noise levels were of the order of 33dB to 41dB L_{Aeq} and 30dB to 33dBL_{A90}.

No significant sources of vibration were observed.

Location 2

The results for Location 2 are summarised in Table 12.2 below.

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	15:13 – 15:28	42	54	38	43	39
	16:20 – 16:35	48	69	37	44	39
	17:27 – 17:42	42	57	38	43	40
Night-time	23:24 – 23:39	34	55	29	36	31
	00:29 – 00:44	38	55	33	39	34
	01:25 -01:40	37	61	26	32	27

Table 12.2 Summary of Measured Noise Levels at Location 2

During the daytime, the dominant source of noise was distant road traffic on nearby roads. Other sources of noise included birdsong, construction noise and pedestrian activity. Noise levels were in the range of 42dB to 48dB L_{Aeq} and 39dB to 40dB L_{A90}.

During the night the amount of road traffic on the roads had reduced significantly, occasional noise associated with pedestrian activity and dogs barking also contributed to the noise climate in the area. Noise levels were in the range of 34dB to 37dB L_{Aeq} and 27dB to 34dB L_{A90}.

No significant sources of vibration were observed.

Location 3

The results for Location 3 are summarised in Table 12.3 below.

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	15:38 – 15:53	70	83	49	72	60
	16:40 – 16:55	69	81	46	72	61
	17:00 – 17:15	69	84	49	71	62
Night-time	23:47 – 00:02	64	80	38	69	42
	00:48 – 01:03	60	80	30	63	35
	01:45 – 02:00	60	78	31	62	34

Table 12.3 Summary of Measured Noise Levels at Location 3

During the daytime, the dominant source of noise was road traffic along the N69 Dock Road. Noise levels were in the range 69 to 70dB L_{Aeq} and 60 to 62dB L_{A90}

During the night the amount of road traffic on the roads had reduced and this is reflected in the lower noise levels measured. Noise levels were in the range of 60dB to 64dB L_{Aeq} and 34dB to 42dB L_{A90}.

No significant sources of vibration were observed.

RETAIL

12.3 Characteristics of the Proposed Development

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

The construction phase will involve earthworks throughout most of the site and the erection of a number of new buildings. This impact is short-term in nature and is assessed in the appropriate section of this document.

The primary sources of noise in the operational context will be deemed long-term and are as follows,

- building services plant;
- car parking on site;
- service yard activity;
- additional vehicular traffic on existing public roads;
- traffic along new road within the development.

12.4 Predicted Impact of the Proposal

12.4.1 Noise Criteria

Due consideration must be given to the nature of the primary noise sources when setting criteria. In this instance, there are five primary sources of noise associated with the development once operational. Criteria for noise from building services, car parking, site vehicle movements and service yard activity plant 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.

There are no Irish Standards containing guidance that are applicable in this instance. In the absence of such standards, best practice dictates that the potential noise impact of the proposed development is assessed against appropriate British and/or International Standards.

The closest existing noise sensitive locations to the proposed development are a number of existing dwellings beyond the southern boundary of the site and an existing halting site located close to the proposed entrance point to the west of the development site. Appropriate guidance is contained within BS8233: Sound Insulation and Noise Reduction for Buildings – Code of Practice (1999). This British Standard sets out recommended noise limits for indoor ambient noise levels as follows:

Criterion for	Typical situation	Design range $L_{Aeq,T}$ (dB)	
		Good	Reasonable
Reasonable resting / sleeping conditions	Living Rooms	30	40
	Bedrooms	30	35

Table 12.4 Recommended indoor ambient noise levels from BS8233 (1999)

Given the urban location of the development site, the nearest neighbouring dwellings and the existing daytime readings, it is considered appropriate to select the Reasonable limit for Living Rooms during the day and the Good limit for Bedrooms during the night. The appropriate internal criteria are therefore 40dB L_{Aeq} day and 30dB L_{Aeq} night.

For the purposes of this study, it is appropriate to derive external limits based on the internal criteria noted in the paragraph above. This is done by factoring in the degree of noise reduction afforded by an open window. BS 8233 Paragraph 8.4.7.3 Table 10 suggests this is in the range 10 –15dB. In order to provide a 'worst case' assessment 10dB will be used.

Due to the fact that there is the potential for short periods of noise to cause a greater disturbance at night, a shorter assessment time period (T) is adopted. Appropriate periods are 1 hour for daytime (07:00 to 23:00 hours) and 5 minutes for night-time (23:00 to 07:00 hours).

In summary, the following criteria apply at the facades of those residential properties closest to the proposed development:

- Daytime (07:00 to 23:00 hours) 50dB $L_{Aeq,1hr}$
- Night-time (23:00 to 07:00 hours) 40dB $L_{Aeq,5min}$

These criteria are also in compliance with the following guidance taken from the World Health Organisation publication "Community Noise".

To protect the majority of people from being moderately annoyed during the daytime, the sound pressure level should not exceed 50dB L_{Aeq}.

At night external sound pressure levels should not exceed 45dB L_{Aeq}, so that people may sleep with bedroom windows open.

In order to assist with the interpretation of the noise associated with vehicular traffic on public roads, Table 12.5 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	Imperceptible	Neutral
3 – 5	Perceptible	Minor
6 – 10	Up to a doubling of loudness	Moderate
11 – 15	Over a doubling of loudness	Major
> 15	-	Severe

Table 12.5 Likely impact associated with change in traffic noise level

12.4.2 Vibration Guidelines

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

It is acknowledged that humans are particularly sensitive to vibration stimuli and that any perception of vibration may lead to concern. In the case of road traffic, vibration is perceptible at around 0.5mm/s and may become disturbing or annoying at higher magnitudes. However, higher levels of vibration are typically tolerated for single events or events of short duration. For example, blasting and piling, two of the primary sources of vibration during construction, are typically tolerated at vibration levels up to 12mm/s and 5mm/s respectively. This guidance is applicable to the daytime only; it is unreasonable to expect people to be tolerant of such activities during the night.

Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- British Standard BS 7385 (1993): Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration, and;
- British Standard BS 5228 (1992): Noise control on construction and open sites Part 4 Code of practice for noise and vibration control during piling.

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.

BS 5228 recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak particle velocity of 10mm/s for intermittent vibration and 5mm/s for continuous vibration. Below these vibration magnitudes minor damage is unlikely, although where there is existing damage these limits may be reduced by up to 50%. For light and flexible industrial and commercial structures threshold limits of 20mm/s for intermittent and 10mm/s for continuous are recommended, whilst for heavy and stiff buildings higher thresholds of 30mm/s for intermittent and 15mm/s for continuous are recommended.

12.4.3 Forecasting Methods

Prediction calculations for building services plant have been conducted generally in accordance with ISO 9613: Acoustics – Attenuation of sound outdoors, Part 2: General method of calculation, 1996.

Traffic noise levels are predicted in accordance with guidance set out in Calculation of Road Traffic Noise (CRTN)[6], giving results in the form of L_{10} values.

12.4.4 Construction Phase

A variety of items of plant will be in use, such as excavators, lifting equipment, dumper trucks, compressors and generators. There will be vehicular movements to and from the site that will make use of existing roads.

Due to the nature of the activities undertaken on a large construction site, there is potential for generation of significant levels of noise. The flow of vehicular traffic to and from a construction site is also a potential source of relatively high noise levels. The potential for vibration at neighbouring sensitive locations during construction is typically limited to excavation works and lorry movements on uneven road surfaces. Due to the proximity of sensitive locations to

[6] *Calculation of Road Traffic Noise*, Department of Transport Welsh Office, HMSO, 1988

potential site access points, the more significant of these is likely to be uneven road surfaces. However, there is little likelihood of structural or even cosmetic damage to existing neighbouring dwellings.

Due to the fact that the construction programme has been established in outline form only, it is not possible to calculate the actual magnitude of noise emissions to the local environment. However, the impact due to construction activities will be transient in nature.

12.4.5 Operational Phase

There are five primary sources of outward noise impact in the operational context:

- building services plant;
- car parking on site;
- service yard activity;
- additional vehicular traffic on existing public roads;
- traffic along new road within the development.

Each of these primary noise sources is addressed in turn.

Note that there are no significant sources of vibration associated with the operational phase of the proposed development.

Building Services Plant

Once a development of this nature becomes fully operational, a variety of electrical and mechanical plant will be required to service the proposed commercial/retail buildings i.e. heating/refrigeration plant, pumping units. Most of this plant will be capable of generating noise to some degree. Some of this plant may operate 24 hours a day, and hence would be most noticeable during quiet periods (i.e. overnight). Noisy plant with a direct line-of-sight to noise sensitive properties would potentially have the greatest impact.

Noise from building services plant will be controlled such that it does not exceed a level of 45dB $L_{Aeq,T}$ at a distance of 10m from the façade of any building associated with the development.

The closest existing noise sensitive locations to the proposed development are the existing dwellings beyond the eastern boundary of the site and the dwellings located within an existing halting site located to the north of the development site.

Taking into account the cumulative effect of building services noise from development buildings and attenuation due to distance, the predicted noise level at the nearest residence east of the development is 15dB $L_{Aeq,T}$. The predicted noise level at the nearest residence to the west of the development is 26dB $L_{Aeq,T}$.

These levels are well within both the daytime criterion of 50dB $L_{Aeq,1hr}$ and the night-time criterion of 40dB $L_{Aeq,5min}$. In summary, the likely noise impact of building services noise on the local environment is not significant.

Car Parking On Site

Car parking on the proposed development site will be provided by means of a number of surface and basement car parks. Noise level measurements have previously been conducted in the vicinity of surface car parks in support of other planning applications. The typical noise level 10m beyond the boundary of these surface car parks during busy daytime periods has been found to fall within the order of 48dB $L_{Aeq,1hr}$

The closest existing noise sensitive locations to the proposed car parking facility are the residential dwellings located at the existing halting site to the north of the development site.

Taking into account the effect of car parking activity noise from development and attenuation due to distance, the predicted noise level at the nearest residence is 22dB $L_{Aeq,1\ hour}$.

This levels is well within the daytime criterion of 50dB $L_{Aeq,1hr}$,therefore, the likely noise impact of building services noise on the local environment is not significant.

Service Yard Activity

Deliveries to the development will be made to a number of service yards located throughout the facility. It is understood that deliveries will occur during the daytime period only i.e. between 07:00hrs and 23:00hrs.

The noise level at a distance of 10m from the vehicle dock of a typical service yard is of the order of 66dB $L_{Aeq,1hr}$. This includes the effects of reflections from store façades and service yard boundaries and contributions from all sources of noise, i.e. vehicles manoeuvring, air brakes, refrigeration units and trolleys.

Existing noise sensitive locations
The nearest noise sensitive locations to the service yards are the existing residential dwellings located beyond the eastern and northern boundaries of the development.

Taking into account the cumulative effect of service yard activity from development buildings and attenuation due to distance, the predicted noise level at the nearest residence east of the development during the daytime period is 34dB $L_{Aeq,1hour}$. The predicted noise level at the nearest residence west of the development during the daytime period is 43dB $L_{Aeq,1\ hour}$.

Proposed new residential development beyond the southern boundary
A residential development is proposed for an area to the south of the site and is the subject of a separate planning application. It is appropriate to also consider the potential impact of the service yard activity on the nearest receptors within this development.

Taking into account the cumulative effect of service yard activity from development buildings and attenuation due to distance, the predicted noise level at the nearest residence within the proposed residential development during the daytime period is 44dB $L_{Aeq,1\ hour.}$

These levels are within the daytime criterion of 50dB $L_{Aeq,1hr}$, therefore the likely noise impact of service yard activity noise on the local environment is not significant.

Additional Vehicular Traffic on Existing Public Roads

Atkins has provided predicted traffic flows with and without the proposed development. Table 12.6 below indicates resultant traffic flows and changes in noise levels associated with the proposed commercial/retail development when combined with predicted traffic flows associated with a residential development proposed for an area to the south of the site which is the subject of a separate planning application.

This information has been used to determine the predicted change in noise levels adjacent to various roads in the vicinity of the site. The method for calculating the increase in noise is based upon the procedures within the CRTN.

Junction/Road	Change in Noise Level (dB) associated with Peak Hour Levels for Year		
	2008	2010	2020
Dock Road west of development Entrance	No Change	+3	+3
Dock Road east of Development Entrance	No Change	+1	+1
Dock Road west of Courtbrack Avenue	No Change	+1.5	+1.5
Dock Road East of Atlas Avenue	No Change	+1	+1
Dock Road west of R510	No Change	No Change	+1
R510 south of Dock Road	No Change	+1	+1
Courtbrack Avenue south Dock Road	No Change	+1	+1

Table 12.6 Summary of Peak Hour traffic flows provided by Atkins for base year and calculated relative change in traffic noise levels (to nearest 0.5dB) resulting from the commercial development

The predicted increase in peak hour traffic levels associated with the development will result in an increase of 3dB or less in the vicinity of roads and junctions surrounding the proposed development. Reference to Table 12.5 confirms that this increase is imperceptible and the resultant impact is not significant.

In summary, the predicted increase in noise levels associated with vehicles at any of the road junctions in the vicinity of the proposed development is not significant.

Traffic along New Road within the Development

As part of this development a new road will be constructed through the proposed commercial retail development site.

Where new roads are constructed within the development it is appropriate to assess noise from traffic in terms of absolute noise levels at the façade of the nearest noise-sensitive location.

Atkins has provided predicted traffic flows associated with the proposed commercial/retail development when combined with predicted traffic flows associated with a residential development that is proposed for an area to the south of the site which is the subject of a separate planning application.

The 'worst case' peak hourly traffic flow for the year 2020 has been used to determine the predicted noise level at the facade of the nearest residential dwellings to the development.

The nearest noise-sensitive locations to the proposed new roadway are the residential dwellings located within the existing halting site close to the entrance to the proposed development.

Taking into account distance attenuation the predicted noise level at the nearest dwelling associated with traffic along the new roadway is 49dB $L_{Aeq,\ 1hour}$. The existing daytime noise levels measured in the vicinity of this junction were in the range 69 to 70 dB L_{Aeq} and 70 to 72 dB $L_{A10.}$ It may be concluded that when compared with existing noise levels from all sources in the area there will no significant impact.

12.5 Mitigation Measures

In order to sufficiently ameliorate the likely noise impacts, a schedule of noise control measures has been formulated for both construction and operational phases.

12.5.1 Construction Phase

With regard to construction activities, reference will be made to BS5228: Noise control on construction and open sites, which offers detailed guidance on the control of noise & vibration from demolition and 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 or vibration are permitted;
- establishing channels of communication between the contractor/developer, Local Authority and residents;
- appointing a site representative responsible for matters relating to noise and vibration;
- monitoring typical levels of noise and vibration during critical periods and at sensitive locations;

Furthermore, it is envisaged that a variety of practicable noise control measures will be employed. These may include:

- selection of plant with low inherent potential for generation of noise and/ or vibration;
- erection of barriers as necessary around items such as generators or high duty compressors;
- situate noisy / vibratory plant as far away from sensitive properties as permitted by site constraints and the use of vibration isolated support structures where necessary;
- all site access roads will be kept even so as to mitigate the potential for vibration from lorries.

Assimilating the guidance in the Vibration Guidelines section above, it is recommend that the allowable transient vibration during construction (in terms of peak particle velocity in mm/s) at the closest foundation of any building structure should normally be limited to the values set out in Table 12.7. It should be noted that these limits are not absolute, but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage these limits may need to be reduced by up to 50%.

Type of structure	Frequency of vibration		
	Less than 10Hz	10 to 50Hz	50 to 100Hz (and above)
Particularly sensitive / listed building	3 mm/s	3 to 8 mm/s	8 to 10 mm/s
Dwellings	5 mm/s	5 to 15 mm/s	15 to 20 mm/s
Light & flexible industrial/commercial	10 mm/s	10 to 30 mm/s	30 to 40 mm/s
Heavy and stiff buildings	20 mm/s	20 to 40 mm/s	40 to 50 mm/s

Table 12.7 Peak Particle Velocities (ppv in mm/s) Below Which Transient Vibration Should Not Cause Cosmetic Building Damage

12.5.2 Operational Phase

Building Services Plant

Plant will be sited as far away from noise-sensitive locations as is practicable. Proven noise control techniques will be employed to ensure that the total noise emissions from building services plant comply with the criteria of 50dB $L_{Aeq,1hr}$ daytime and 40dB $L_{Aeq,5min}$ night-time at one metre from the façade of the nearest neighbouring residential dwelling.

With regard to building services plant, it is envisaged that the following forms of noise control techniques may to be employed:

- duct mounted attenuators on the atmosphere side of air moving plant;
- splitter attenuators or acoustic louvres providing free ventilation to internal plant areas;
- solid barriers screening any external plant;
- anti-vibration mounts on reciprocating plant.

Car Parking on the Site

The noise impact assessment outlined above has demonstrated that mitigation measures are not required.

Service Yard Activity

The noise impact assessment outlined above has demonstrated that mitigation measures are not required.

Additional Vehicular Traffic on Public Roads

The noise impact assessment outlined above has demonstrated that mitigation measures are not required.

Traffic Along New Road Within the Development

The noise impact assessment outlined above has demonstrated that mitigation measures are not required.

12.6 Predicted Impact of the Proposal

This section summarises the likely noise impact associated with the proposed development, taking into account the mitigation measures.

12.6.1 Construction Phase

During the construction phase of the project there may be some impact on nearby residential properties due to noise emissions from site traffic and other activities. However, the application of limits for hours of operation and also with the implementation of appropriate noise and vibration control measures will ensure that noise and vibration impact is kept to a minimum.

12.6.2 Operational Phase

Building Services Plant

Proprietary noise and vibration control measures will be employed in order to ensure that noise emissions from building services plant do not exceed the criteria of 50dB $L_{Aeq,1hr}$ daytime

and 40dB $L_{Aeq,5min}$ night-time at 1 metre from the façade of the nearest neighbouring residential dwelling. The resultant noise impact is not significant.

Car Parking on the Site

The predicted noise levels associated with car parking activity on the development site will not exceed the daytime criterion of 50dB $L_{Aeq,1hr}$, hence the impact is not significant.

Service Yard Activity

The predicted noise levels associated with service yard activity on the development site will not exceed the daytime criterion of 50dB $L_{Aeq,1hr}$, hence the impact is not significant.

Additional Vehicular Traffic on Public Roads

The predicted increase in site-generated traffic post-development means that the impact in relation to noise from vehicles on public roads is not significant.

Traffic along new road within the development

The predicted increase in site-generated traffic post-development means that the impact in relation to noise from vehicles on the site entrance road is not significant.

RESIDENTIAL APPLICATION

12.7 Characteristics of the Proposed Development

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

The construction phase will involve earthworks throughout most of the site and the erection of a number of new buildings. This impact is short-term in nature and is assessed in the appropriate section below.

The primary sources of noise in the operational context will be deemed long-term and are discussed below,

- building Services noise;
- additional vehicular traffic on existing public roads;
- traffic along new road within the development.

12.8 Predicted Impact of the Proposal

12.8.1 Noise Criteria

Due consideration must be given to the nature of the primary noise sources when setting criteria. In this instance, there are two primary sources of noise associated with the development once operational. Criteria for noise from building services plant and site vehicle movements 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.

There are no Irish Standards containing guidance that are applicable in this instance. In the absence of such standards, best practice dictates that the potential noise impact of the proposed development is assessed against appropriate British and/or International Standards.

The closest existing noise sensitive locations to the proposed development are a number of existing dwellings beyond the southern boundary of the site and an existing halting site located close to the proposed entrance point to the west of the development site. Appropriate guidance is contained within BS8233: Sound Insulation and Noise Reduction for Buildings – Code of Practice (1999). This British Standard sets out recommended noise limits for indoor ambient noise levels as follows:

Criterion for	Typical situation	Design range $L_{Aeq,T}$ (dB)	
		Good	Reasonable
Reasonable resting / sleeping conditions	Living Rooms	30	40
	Bedrooms	30	35

Table 12.8 Recommended indoor ambient noise levels from BS8233 (1999)

Given the location of the nearest neighbouring dwellings and the existing daytime readings, it is considered appropriate to select the Reasonable limit for Living Rooms during the day and the Good limit for Bedrooms during the night. The appropriate internal criteria are therefore 40dB L_{Aeq} day and 30dB L_{Aeq} night.

For the purposes of this study, it is appropriate to derive external limits based on the internal criteria noted in the paragraph above. This is done by factoring in the degree of noise reduction afforded by an open window. BS 8233 Paragraph 8.4.7.3 Table 10 suggests this is in the range 10 –15dB. In order to provide a 'worst case' assessment 10dB will be used.

Due to the fact that there is the potential for short periods of noise to cause a greater disturbance at night, a shorter assessment time period (T) is adopted. Appropriate periods are 1 hour for daytime (07:00 to 23:00 hours) and 5 minutes for night-time (23:00 to 07:00 hours).

In summary, the following criteria apply at the facades of those residential properties closest to the proposed development:

- Daytime (07:00 to 23:00 hours) 50dB $L_{Aeq,1hr}$
- Night-time (23:00 to 07:00 hours) 40dB $L_{Aeq,5min}$

These criteria are also in compliance with the following guidance taken from the World Health Organisation publication "Community Noise".

To protect the majority of people from being moderately annoyed during the daytime, the sound pressure level should not exceed 50dB L_{Aeq}.

At night external sound pressure levels should not exceed 45dB L_{Aeq}, so that people may sleep with bedroom windows open.

In order to assist with the interpretation of the noise associated with vehicular traffic on public roads, Table 12.5 above offers guidance as to the likely impact associated with any particular change in traffic noise level.

12.8.2 Vibration Guidelines

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

It is acknowledged that humans are particularly sensitive to vibration stimuli and that any perception of vibration may lead to concern. In the case of road traffic, vibration is perceptible at around 0.5mm/s and may become disturbing or annoying at higher magnitudes. However, higher levels of vibration are typically tolerated for single events or events of short duration. For example, blasting and piling, two of the primary sources of vibration during construction, are typically tolerated at vibration levels up to 12mm/s and 5mm/s respectively. This guidance

is applicable to the daytime only; it is unreasonable to expect people to be tolerant of such activities during the night.

Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- British Standard BS 7385 (1993): *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration*, and;
- British Standard BS 5228 (1992): *Noise control on construction and open sites Part 4 Code of practice for noise and vibration control during piling*.

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.

BS 5228 recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak particle velocity of 10mm/s for intermittent vibration and 5mm/s for continuous vibration. Below these vibration magnitudes minor damage is unlikely, although where there is existing damage these limits may be reduced by up to 50%. For light and flexible industrial and commercial structures threshold limits of 20mm/s for intermittent and 10mm/s for continuous are recommended, whilst for heavy and stiff buildings higher thresholds of 30mm/s for intermittent and 15mm/s for continuous are recommended.

12.8.3 Forecasting Methods

Prediction calculations for building services plant have been conducted generally in accordance with ISO 9613: *Acoustics – Attenuation of sound outdoors, Part 2: General method of calculation, 1996.*

Traffic noise levels are predicted in accordance with guidance set out in *Calculation of Road Traffic Noise (CRTN)*[7], giving results in the form of L_{10} values.

12.8.4 Construction Phase

A variety of items of plant will be in use, such as excavators, lifting equipment, dumper trucks, compressors and generators. There will be vehicular movements to and from the site that will make use of existing roads.

Due to the nature of the activities undertaken on a large construction site, there is potential for generation of significant levels of noise. The flow of vehicular traffic to and from a construction site is also a potential source of relatively high noise levels. The potential for vibration at neighbouring sensitive locations during construction is typically limited to excavation works and lorry movements on uneven road surfaces. Due to the proximity of sensitive locations to potential site access points, the more significant of these is likely to be uneven road surfaces. However, there is little likelihood of structural or even cosmetic damage to existing neighbouring dwellings.

Due to the fact that the construction programme has been established in outline form only, it is not possible to calculate the actual magnitude of noise emissions to the local environment. However, the impact due to construction activities will be transient in nature.

12.8.5 Operational Phase

There are three primary sources of outward noise impact in the operational context and each of these primary noise sources is addressed in turn.

[7] *Calculation of Road Traffic Noise*, Department of Transport Welsh Office, HMSO, 1988

- building services plant;
- additional vehicular traffic on public roads;
- traffic along new road within the development.

Note that there are no significant sources of vibration associated with the operational phase of the proposed development.

Building Services Plant

Once a development of this nature becomes fully operational, a variety of electrical and mechanical plant will be required to service some of the proposed residential buildings i.e. lift motor equipment, heating plant, pumping units. Most of this plant will be capable of generating noise to some degree. Some of this plant may operate 24 hours a day, and hence would be most noticeable during quiet periods (i.e. overnight). Noisy plant with a direct line-of-sight to noise sensitive properties would potentially have the greatest impact.

Noise from building services plant will be controlled such that it does not exceed a level of 45dB $L_{Aeq,T}$ at a distance of 10m from the façade of any building associated with the development.

The closest existing noise sensitive locations to the proposed development are the existing dwellings beyond the southern boundary of the site.

Taking into account the cumulative effect of building services noise from development buildings and attenuation due to distance, the predicted noise level at the nearest residence east of the development is 24dB $L_{Aeq,T}$. This level is well within both the daytime criterion of 50dB $L_{Aeq,\ 1hr}$ and the night-time criterion of 40dB $L_{Aeq,5min}$. In summary, the likely noise impact of building services noise on the local environment is not significant.

Additional Vehicular Traffic on Existing Public Roads

Atkins has provided predicted traffic flows with and without the proposed development. Table 12.9 below indicates resultant traffic flows and changes in noise levels associated with the proposed residential development when combined with predicted traffic flows associated with a commercial retail development proposed for an area to the north of the site which is the subject of a separate planning application.

This information has been used to determine the predicted change in noise levels adjacent to various roads in the vicinity of the site. The method for calculating the increase in noise is based upon the procedures within the CRTN.

Junction/Road	Change in Noise Level (dB) associated with Peak Hour Levels for Year		
	2008	2010	2020
Dock Road west of development Entrance	No Change	+3	+3
Dock Road east of Development Entrance	No Change	+1	+1
Dock Road west of Courtbrack Avenue	No Change	+1.5	+1.5
Dock Road East of Atlas Avenue	No Change	+1	+1
Dock Road west of R510	No Change	No Change	+1
R510 south of Dock Road	No Change	+1	+1
Courtbrack Avenue south Dock Road	No Change	+1	+1

Table 12.9 Summary of Peak Hour traffic flows provided by Atkins for base year and calculated relative change in traffic noise levels (to nearest 0.5dB) resulting from the residential development

The predicted increase in peak hour traffic levels associated with the development will result in an increase of 3dB or less in the vicinity of roads and junctions surrounding the proposed development. Reference to Table 12.5 confirms that this increase is imperceptible and the resultant impact is not significant.

In summary, the predicted increase in noise levels associated with vehicles at any of the road junctions in the vicinity of the proposed development is not significant.

Traffic along New Road within the Development

As part of this development a new road will be constructed to access the proposed residential development site.

Where new roads are constructed within the development it is appropriate to assess noise from traffic in terms of absolute noise levels at the façade of the nearest noise-sensitive location.

Atkins has provided predicted traffic flows associated with the proposed residential development when combined with predicted traffic flows associated with a commercial/retail development that is proposed for an area to the north of the site which is the subject of a separate planning application.

The 'worst case' peak hourly traffic flow for the year 2020 has been used to determine the predicted noise level at the facade of the nearest residential dwellings to the new road within the development.

The nearest noise-sensitive locations to the proposed new roadway are the residential dwellings located within the existing halting site close to the entrance to the proposed development.

Taking into account distance attenuation, the predicted noise level at the nearest dwelling associated with traffic along the new roadway is 49dB $L_{Aeq,\ 1hour}$. The existing daytime noise levels measured in the vicinity of this junction were in the range 69 to 70 dB L_{Aeq} and 70 to 72 dB L_{A10}. It may be concluded that when compared with existing noise levels from all sources in the area there will no significant impact.

12.9 Mitigation Measures

In order to sufficiently ameliorate the likely noise impacts, a schedule of noise control measures has been formulated for both construction and operational phases.

12.9.1 Construction Phase

With regard to construction activities, reference will be made to BS5228: Noise control on construction and open sites, which offers detailed guidance on the control of noise & vibration from demolition and 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 or vibration are permitted;
- establishing channels of communication between the contractor/developer, Local Authority and residents;
- appointing a site representative responsible for matters relating to noise and vibration;
- monitoring typical levels of noise and vibration during critical periods and at sensitive locations;

Furthermore, it is envisaged that a variety of practicable noise control measures will be employed. These may include:

- Selection of plant with low inherent potential for generation of noise and/ or vibration;
- Erection of barriers as necessary around items such as generators or high duty compressors;
- Situate noisy / vibratory plant as far away from sensitive properties as permitted by site constraints and the use of vibration isolated support structures where necessary.
- all site access roads will be kept even so as to mitigate the potential for vibration from lorries.

Assimilating the guidance in the Vibration Guidelines section above, it is recommend that the allowable transient vibration during construction (in terms of peak particle velocity in mm/s) at the closest foundation of any building structure should normally be limited to the values set out in Table 12.7 above. It should be noted that these limits are not absolute, but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage these limits may need to be reduced by up to 50%.

12.9.2 Operational Phase

Building Services Plant

Plant will be sited as far away from noise-sensitive locations as is practicable. Proven noise control techniques will be employed to ensure that the total noise emissions from building services plant comply with the criteria of 50dB $L_{Aeq,1hr}$ daytime and 40dB $L_{Aeq,5min}$ night-time at one metre from the façade of the nearest neighbouring residential dwelling.

With regard to building services plant, it is envisaged that the following forms of noise control techniques may to be employed:

- duct mounted attenuators on the atmosphere side of air moving plant;
- splitter attenuators or acoustic louvres providing free ventilation to internal plant areas;
- solid barriers screening any external plant;
- anti-vibration mounts on reciprocating plant.

Additional Vehicular Traffic on Public Roads

The noise impact assessment outlined above has demonstrated that mitigation measures are not required.

Traffic Along New Road Within the Development

The noise impact assessment outlined above has demonstrated that mitigation measures are not required.

12.10 Predicted Impact of the Proposal

This section summarises the likely noise impact associated with the proposed development, taking into account the mitigation measures.

12.10.1 Construction Phase

During the construction phase of the project there may be some impact on nearby residential properties due to noise emissions from site traffic and other activities. However, the application of limits for hours of operation and also with the implementation of appropriate noise and vibration control measures will ensure that noise and vibration impact is kept to a minimum.

12.10.2 Operational Phase

Building Services Plant

Proprietary noise and vibration control measures will be employed in order to ensure that noise emissions from building services plant do not exceed the criteria of 50dB $L_{Aeq,1hr}$ daytime and 40dB $L_{Aeq,5min}$ night-time at 1 metre from the façade of the nearest neighbouring residential dwelling. The resultant noise impact is not significant.

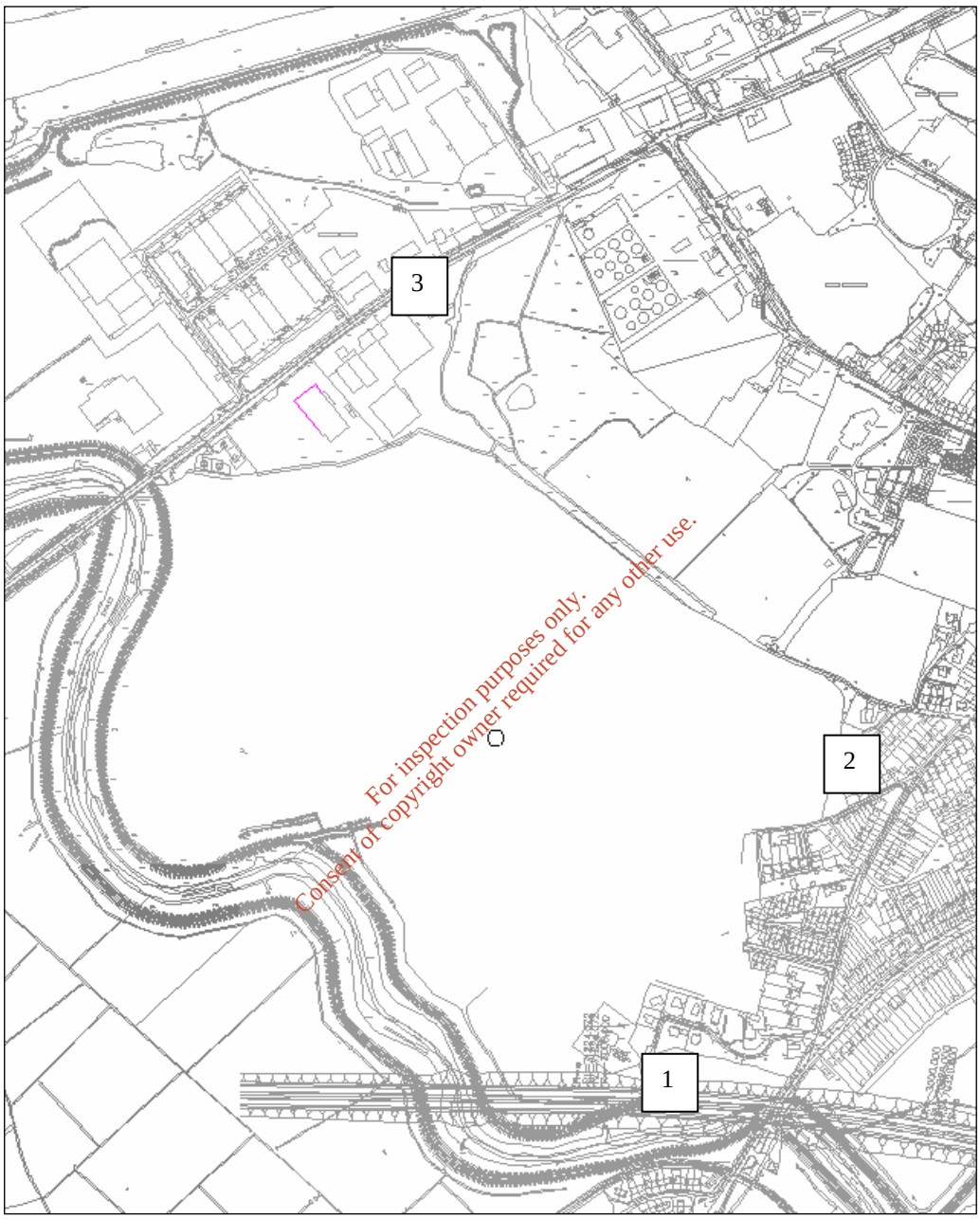
Additional Vehicular Traffic on Public Roads.

The predicted increase in site-generated traffic post-development means that the impact in relation to noise from vehicles on public roads is not significant.

Traffic along new road within the development

The predicted increase in site-generated traffic post-development means that the impact in relation to noise from vehicles on the site entrance road is not significant.

FIGURE 12.1
Site Layout Showing Approximate Position of Noise Measurement Locations



CHAPTER THIRTEEN: EFFECT ON THE ENVIRONMENT - AIR & CLIMATE

13.1 Introduction

AWN Consulting Limited has been commissioned to conduct an assessment into the likely impact on air quality and climate associated with the proposed mixed use development. This Air assessment has been prepared in two parts, firstly in relation to the retail elements and secondly in relation to the residential development. The cumulative impact of both the commercial and residential developments has been determined.

This chapter assesses the entire site, and includes the section of the site which is subject to the withdrawn retail application.

RETAIL DEVELOPMENT

13.2 Description of Existing Environment

13.2.1 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 Tables 13.1-13.5 and Appendix A1).

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 2002, which incorporate EU Directives 1999/30/EC and 2000/69/EC (see Tables 13.1 – 13.2). 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 European Commission sponsored report "Second Position Paper on Particulate Matter – draft for discussion" (21/08/03) has recommended that the principal metric for assessing exposure to particulates should be $PM_{2.5}$ rather than PM_{10} after 2010. The report also suggests that the annual average should be in the range 12 – 20 µg/m^3 which should be compared with the PM_{10} annual limit value, to be complied with in 2005, of 40 µg/m^3. In relation to the maximum 24-hour limit value, a starting point for discussion has been set at 35 µg/m^3 as a 90th%ile. These indicative limit values will be reviewed in the light of further information on health and environmental effects, technical feasibility etc.

The impact of the development should also be assessed in terms of the relative additional contribution of the development, expressed as a percentage of the limit value. Although no relative impact, as a percentage of the limit value, is enshrined in EU or Irish Legislation, the USEPA has adopted relative impact criteria based on the applicable limit value. The criteria termed PSD (Prevention of Significant Deterioration) is used alongside the absolute limit values defined by the USEPA (NAAQS - National Ambient Air Quality Standards) (see Table 13.4). The PSD regulations have been formulated to ensure air quality remains good, while maintaining a margin for future growth. The PSD is generally applied to industrial facilities whereas the impact of road developments are compared with the absolute limits in the NAAQS. However, the PSD approach has been adopted for determining the relative impacts of the development in the current context. The upper and lower assessment thresholds for pollutants outlined in the EU Directives have been incorporated into the significance criteria for the development (see Appendix A1). The significance criteria adopted are detailed in Tables 13.6 – 13.7, and take into account both the absolute and relative impact of the development.

13.2.2 Climate Agreements

Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) in April 1994 and the Kyoto Protocol in principle in 1997 and formally in May 2002[1,2]. For the purposes of the EU burden sharing agreement under Article 4 of the Kyoto Protocol, in June 1998, Ireland agreed to limit the net growth of the six GHGs under the Kyoto Protocol to 13% above the 1990 level over the period 2008 to 2012[3,4]. 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 (COP9) to the agreement was convened in Milan in December 2003. In Article 5 of the Kyoto Protocol, it states that the methodologies for estimating anthropogenic emissions by sources and removal by sinks of all greenhouse gases (except those controlled by the Montreal Protocol) shall be those accepted by the Intergovernmental Panel on Climate Change (IPCC).

13.2.3 Methodology

The assessment of air quality has been carried out using a phased approach as recommended by the UK DEFRA (formerly the UK DETR)[5,6]. 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 possible key pollutants was carried out and the likely location of air pollution "hot-spots" identified. An examination of recent EPA and Local Authority data in Dublin and Ireland[7-10], has indicated that SO_2, 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[7-10]. Benzene, although previously reported at quite high levels in urban centres[9], has recently been measured at several city centre locations to be well below the EU limit value[7,10].

The current assessment thus focused firstly on identifying the existing baseline levels of NO_2, PM_{10} and benzene in the region of the proposed development, both currently (using available monitoring data) and when the development is opened (through modelling). Thereafter, the impact of the development on air quality at the neighbouring sensitive receptors was determined relative to the existing baseline when the development is opened (2008)[8] and in the design year (2020). The assessment methodology involved air dispersion modelling using the UK DMRB Screening Model[11] (Version 1.02 (Released November 2003)) and following guidance issued by the UK DEFRA[12-14]. The inputs to the air dispersion model consist of information on road layouts, receptor locations, annual average daily traffic movements (e.g. AADT), annual average traffic speeds and background concentrations. Using this input data the model predicts ambient ground level concentrations at the worst-case sensitive receptor using generic meteorological data. This worst-case concentration is then added to the existing background concentration to give the worst-case predicted ambient concentration. This worst-case predicted ambient concentration is then compared with the relevant ambient air quality standard to assess the compliance of the proposed development with these ambient air quality standards. An assessment was carried out for the four pollutants NO_2, PM_{10}, benzene and CO.

13.2.4 Meteorological Data

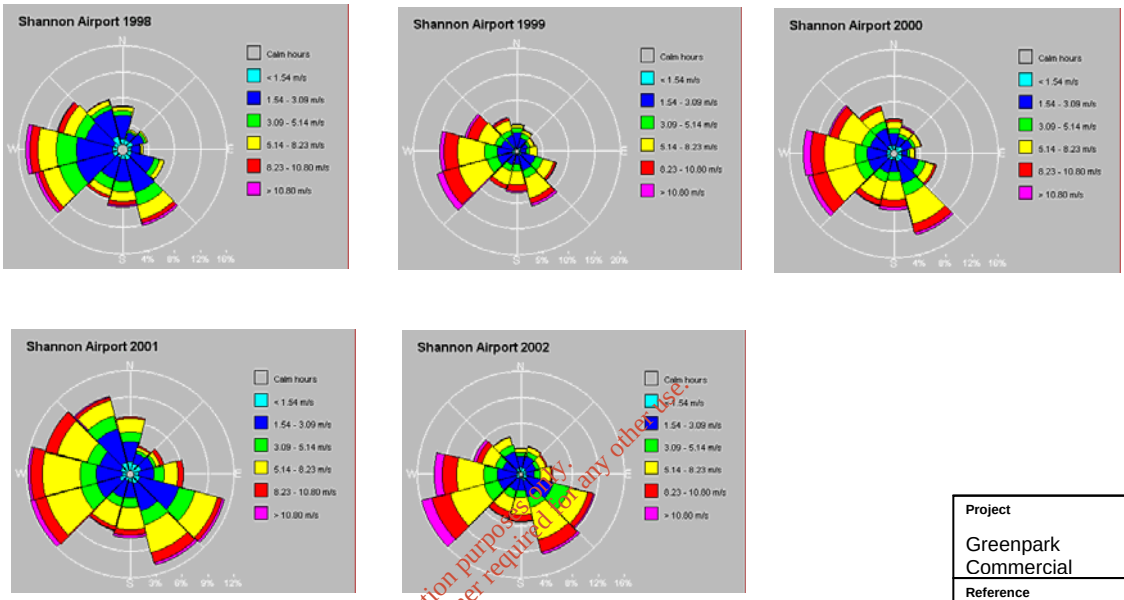
A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels)[15]. Wind 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})

[8] 2008 is used to correspond with the baseline date used in the traffic chapter

will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Shannon Airport, which is located approximately 20 km northwest of the site. Shannon Airport has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 13.1). For data collated during five representative years (1998-2002), the predominant wind direction is south-westerly with an average wind speed of approximately 3-5 m/s.

Figure 13.1 Shannon Airport Windrose 1998-2002



Project: Greenpark Commercial
Reference: 04 2316AR01[2]
Figure 13.1: Shannon Airport Windrose 1998-2002

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13.2.5 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, air pollution concentrations from road sources generally decreases significantly with distance from the road source[(11)]. Thus, residential exposure in urban and suburban areas will be determined by the location of sensitive receptors relative to major roads sources in the area. Typically, the air quality experienced at residential receptors will be significantly less than worst-case levels reported by the EPA, such as urban city centres. Temporally, air quality can vary significantly by several 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 a monitoring study such as that described above would provide

information on current air quality it would not be able to provide predictive information on baseline conditions[6], which are the conditions which prevail just prior to opening in the absence of the development (Year 2008). Hence the impacts of the development were fully assessed by air dispersion modelling[6] 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 minimum" and "do something" scenario will minimise errors and allow an accurate determination of the relative impact of the development.

13.2.6 Available Background Data

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 Report 2002" (EPA, 2003)[9], details the range and scope of monitoring undertaken throughout Ireland. Ireland is divided into four zones for monitoring and assessment purposes: Dublin (Zone A), Cork Urban Area (Zone B), 16 specified population centres with <15,000 inhabitants (Zone C) and non-urban areas (Zone D). In terms of air monitoring and assessment, Limerick is categorised as Zone C[9]. The EPA carried out extensive monitoring in Limerick over the period January to November 2000. The results give an indication of the ambient levels of a number of pollutants at Mulgrave Street, close to the city centre[10].

Current background concentrations of the pollutants NO_2, PM_{10}, CO and benzene were estimated based on the 2000 monitoring data for Limerick, along with more recent Zone C monitoring data. Background concentrations in 2008 and 2020 were then estimated using the Netcen background calculator, which uses year on year reduction factors provided by DEFRA[5].

The average city centre NO_2 level measured by the EPA in Limerick during the 2000 monitoring campaign was 22 $\mu g/m^3$. In addition, data is available for two Zone C locations; Drogheda and Dundalk in 2002[9], with annual average concentrations of 23 and 14 $\mu g/m^3$ respectively. Based on the above information, conservative estimates of the background NO_2 concentrations in 2008 and 2020 respectively are 19 $\mu g/m^3$ and 17 $\mu g/m^3$.

In terms of CO, monitoring was carried out by the EPA at Mulgrave Street in 2000[10], with an average level of 0.30 mg/m^3. In addition, data for Drogheda and Dundalk in 2002 gave annual average levels of 0.33 and 0.44 mg/m^3 respectively[9]. Based on the above information, estimates of the background CO concentrations in 2008 and 2020 respectively are 0.15 $\mu g/m^3$ and 0.12 $\mu g/m^3$.

Monitoring for benzene was also carried out by the EPA at Mulgrave Street in 2000[10], with levels averaging at 0.50 $\mu g/m^3$. In addition, data for Drogheda and Dundalk in 2002 gave annual average levels of 1.3 and 0.4 $\mu g/m^3$ respectively[9]. Based on the above information, estimates of the background benzene concentrations in 2008 and 2020 respectively are 0.50 and 0.47 $\mu g/m^3$.

The results of PM_{10} monitoring carried out at Mulgrave Street in 2000[10] showed that there were no exceedances of the 24-hour limit value during the monitoring period. Furthermore, the average level measured was 24 $\mu g/m^3$. Data for Drogheda and Dundalk in 2002 gave annual average levels of 32 and 23 $\mu g/m^3$ respectively[9]. Data from the Phoenix Park in Dublin provides a good indication of urban background levels, with an annual average in 2002 of 15 $\mu g/m^3$. Based on the available data, conservative estimates of the background PM_{10} concentrations in 2008 and 2020 of 18 $\mu g/m^3$ and 17 $\mu g/m^3$ have been used.

13.3 Characteristics of the Proposed Development

As stated above, road traffic would be expected to be the dominant source of emissions in the region of the development (with the possible exception of PM_{10}) and thus is the focus of the current assessment. Detailed traffic flow information was obtained from the traffic consultant for the project and has been used to model pollutant levels under various traffic scenarios and under sufficient spatial resolution to assess whether any significant air quality impact on sensitive receptors may occur.

Cumulative effects have been assessed, as recommended in the EU Directive on EIA (Council Directive 97/11/EC) and using the methodology of the UK DEFRA[5,6]. Firstly, background concentrations[11] have been included in the modelling study, for both “do minimum” and “do something” scenarios. These background concentrations are year-specific and account for non-localised sources of the pollutants of concern[11]. Appropriate background levels were selected based on the available monitoring data provided by the EPA and Local Authorities[7-10] (see above).

Once appropriate background concentrations were established (see Table 13.8), the existing situation, including background levels, was assessed in the absence of the development for the opening year (Year 2008) and the development year (Year 2020). The cumulative effect of the baseline situation and the additional impact of the development has also been assessed for the opening year (Year 2008) and the development year (Year 2020). This assessment allows the significance of the development, with respect to both relative and absolute impact, to be determined both temporally and spatially.

13.3.1 Air Dispersion Modelling

The assessment methodology involved air dispersion modelling using the UK DMRB Screening Model (Version 1.02)[11] and following guidance issued by the UK DEFRA[12-14]. Ambient concentrations for CO, benzene, NO_2 and PM_{10} for the opening year (2008) and design year (2020), at the nearest sensitive receptors to the development, have been modelled. "Do minimum" and “do something” modelling was carried out at the building façade of the worst-case receptors for both 2008 and 2020. An assessment was also carried out for at two different average traffic speeds, typical of worst-case peak-hour (10 km/hr) and average (40 km/hr) driving conditions.

13.3.2 Climate

Road traffic would be expected to be the dominant source of greenhouse gas emissions as a result of the development. Vehicles will give rise to CO_2 and N_2O emissions near the proposed development.

13.4 Predicted Impact of the Proposal

The results of the dispersion modelling and impact assessment are detailed in the following sections. The traffic data used for the assessment included predicted flows for the commercial and residential developments. Hence the cumulative impact of both developments are described below. The results discussed are based on an average speed of 40 km/hr, with the reduction in speed to 10 km/hr treated separately. Three receptors were modelled in the region of the development; (1) on Courtbrack Avenue, (2) on the Dock Road, west of the proposed entrance and (3) adjacent to the proposed site road within the development. Receptor (3) is proposed as part of the adjacent residential development.

13.4.1 "Do minimum" Modelling Assessment

PM_{10}, CO and Benzene

The results of the "do minimum" modelling assessment for PM_{10}, CO and benzene in the opening year are shown in Tables 13.9 – 13.11. Concentrations are well within the limit values under all scenarios at all worst-case receptors. Levels of all three pollutants range from 11 - 51% of the respective limit values in 2008.

The temporal trend in these pollutants can be established by an examination of levels in 2008 and 2020 (see Tables 13.9 – 13.11). Future trends for the “do minimum” scenario indicate even lower levels of PM_{10}, CO and benzene. "Do minimum" levels of all three pollutants range from 10% of the limit value for benzene to 45% of the annual limit value for PM_{10} in 2020.

NO_2

The results of the "do minimum" assessment for NO_2 in the opening year are shown in Tables 13.9 – 13.11. Concentrations are below the annual limit value under all scenarios at all locations. Future trends for the “do minimum” scenario indicate decreasing annual levels of NO_2. "Do minimum" annual average levels of NO_2 range from 43 – 64% of the annual limit value in 2008 and 2020.

The EU limit value for the maximum one-hour standard for NO_2 is based on a one-hour mean not to be exceeded more than 18 times a year (99.8^{th}%ile). "Do minimum" levels in 2008 are below this limit value, with levels at the worst-case receptor 64% of the EU limit value.

Temporally, "do minimum" levels of maximum one-hour NO_2 concentrations over the period 2008 to 2020 will decrease appreciably, with levels peaking at 50% of the limit value at the worst-case receptor in the design year (2020) (see Tables 13.9 – 13.11).

$PM_{2.5}$

The results of the "do minimum" modelling assessment for $PM_{2.5}$ in the opening year are shown in Tables 13.12 - 13.13. Results are reported at the worst-case receptors at a rush hour speed of 10 km/hr. The $PM_{2.5}$ concentration peaks at 16.2 $\mu g/m^3$ as an annual average in 2008. This level is between the range of annual limit values which may be set after 2010.

The temporal trend in $PM_{2.5}$ can be established by an examination of levels in 2008 and 2020 (see Tables 13.12 - 13.13). "Do minimum" levels of $PM_{2.5}$ will decrease to 11.8 $\mu g/m^3$ in 2020 which is below the range of the annual limit values which may be in place after 2010.

13.4.2 Modelled Impact of the Development Once Operational

PM_{10}, CO and Benzene

The results of the modelled impact of the development for PM_{10}, CO and benzene in the opening year are shown in Tables 13.9 – 13.11. The cumulative impact of both "do minimum" traffic levels and additional traffic due to the development are presented. Concentrations are below the ambient standards under all scenarios. Levels of all three pollutants range from 11 - 52% of the respective limit values in 2008.

Future trends, with the development in place, indicate lower levels of CO, benzene and PM_{10}. Levels of all three pollutants are below the relevant limit values under all scenarios. Levels of all three pollutants range from 10 - 48% of the respective limit values in 2020.

The impact of the development can be assessed relative to "do minimum" levels in both the opening and design year (see Tables 13.9 – 13.11). For PM_{10}, CO and benzene, relative to "do minimum" levels, the impact of the development will generally lead to some small increases as a result of the development. As a worst-case, levels will increase by 7% of the respective limit values.

Thus, using the assessment criteria outlined in Tables 13.6 and 13.7, the impact of the development in terms of PM_{10}, CO and benzene is imperceptible.

NO_2

The result of the assessment of the impact of the development for NO_2 in the opening year (2008) is shown in Tables 13.9 – 13.11. The annual average concentration is within the annual limit value for all scenarios. Future trends, with the development in place, indicate reduced annual levels of NO_2. Levels of NO_2 range from 43 - 65% of the annual limit value in 2008 and 2020. The impact of the development will account for only 9% of the annual limit values in either 2008 or 2020.

Maximum one-hour NO_2 levels in 2008 (as a 99.8th%ile), with the development in place, will be significantly below the limit value, with levels at the worst-case receptor 65% of the limit value. Temporally, levels of maximum one-hour NO_2 concentrations, with the development in place, will decrease by 5% of the limit value between 2008 and 2020.

The impact of the development on maximum one-hour NO_2 levels can be assessed relative to "do minimum" levels in both the opening and design year (see Tables 13.9 – 13.11). Levels are generally marginally higher with the development in place, by up to 9% of the limit value. However, predicted levels will still be well below the NO_2 maximum one-hour limit value, with worst-case levels peaking at 60% of the limit value in 2020.

Thus, using the assessment criteria outlined in Tables 13.6 and 13.7, the impact of the development in terms of NO_2 is imperceptible.

$PM_{2.5}$

The result of the assessment of the impact of the development for $PM_{2.5}$ in the opening year (2008) is shown in Tables 13.12 - 13.13. Results are reported at the worst-case receptor at a rush hour speed of 10 km/hr. The $PM_{2.5}$ concentration peaks at 16.7 g/m^3 as an annual average in 2008. This level is between the range of limit values which may be set after 2010. Worst-case levels of $PM_{2.5}$, with the development in place, will decrease to 14.4 µg/m^3 in 2020 which is at the lower end of the range of annual limit values which may be in place after 2010.

The impact of the development on annual average $PM_{2.5}$ levels can be assessed relative to "do minimum" levels in both the opening and design year (see Tables 13.12 - 13.13). Levels are marginally higher with the development in place, by only 3% of the middle of the range of possible limit values in 2020.

Thus, using the assessment criteria outlined in Tables 13.6 and 13.7, the impact of the development in terms of $PM_{2.5}$ is imperceptible.

Variation in Traffic Speed

An assessment of the effect of changing the traffic speed on all roads from an average speed of 40 km/hr to a worst case peak hour speed of 10 km/hr indicates that under normal driving conditions pollutant levels will be lower than at the worst-case traffic speed. Nevertheless, pollutant levels are still below the relevant limit values under worst-case traffic speeds.

13.4.3 Summary of Modelling Assessment

"Do minimum" modelling assessments for PM_{10}, CO and benzene indicate that concentrations will be significantly within the ambient air quality standards under all scenarios. In addition, the impact of the development will account for only 7% of the respective limit values. Cumulatively, levels will still be well within the ambient air quality limit values under all scenarios. Levels of all three pollutants, with the development in place, range from 10 - 52% of the respective limit values in 2008 and 2020. Thus, the impact of the development for these three pollutants is imperceptible.

The modelling assessment for NO_2 indicates that annual concentrations will be well within the air quality standard under all scenarios. Levels of NO_2, with the development in place, range from 43 - 65% of the annual limit value in 2008 and 2020. The maximum one-hour modelling assessment for NO_2 also indicates that levels will be within the applicable limit value in 2008 and 2020 for all scenarios. The impact of the development on NO_2 levels will be to increase levels by 9% of the respective maximum one-hour limit values in either 2008 or 2020. However, predicted levels will still be below the NO_2 maximum one-hour limit value, with worst-case levels peaking at 65% of the limit value in 2008 and at 60% of the limit value in 2020. Thus, the impact of the development, in terms of NO_2, is deemed imperceptible.

"Do minimum" modelling assessments for $PM_{2.5}$ indicate that concentrations will be significantly within the ambient air quality standards under all scenarios. In addition, the

impact of the development will account for only 3% of the annual limit value. Cumulatively, levels will still be within the ambient air quality limit values under all scenarios. Levels of $PM_{2.5}$ peak at 90% of the middle of the range of limit values in 2020. Thus, the impact of the development for $PM_{2.5}$ is imperceptible.

In summary, levels of traffic-derived air pollutants will not exceed the ambient air quality standards both with and without the development in place. Thus, using the assessment criteria outlined in Tables 13.6 and 13.7, the impact of the development in terms of NO_2, PM_{10}, $PM_{2.5}$, CO and benzene is imperceptible.

13.4.4 Climate Impact

Greenhouse gas emissions, as a result of this development, will be imperceptible in terms of Ireland's obligations under the Kyoto Protocol[1,2]. In addition the cumulative impact of the residential and commercial developments will be imperceptible.

13.4.5 Modification Of Atmospheric Conditions

The size and nature of the development and the nature and volume of emissions will be imperceptible.

13.4.6 Modification Of The Existing Heat Balance In The Area

Mesoscale meteorological modelling results indicate that heat islands in US cities may lead to 1.5-3ºC increases relative to the suburbs in the afternoon in summer[17]. Relative to this kind of increase, the size and nature of the proposed development and the nature and volume of emissions will be imperceptible.

13.5 Mitigation measures to reduce adverse effects

13.5.1 Air Quality

Mitigation measures in relation to traffic-derived pollutants have focused generally on improvements in both engine technology and fuel quality. Recent EU legislation, based on the EU sponsored Auto-Oil programmes, has imposed stringent emission standards for key pollutants (Euro III and Euro IV (98/69/EC) for passenger cars to be complied with in 2001 and 2006 respectively and Euro III, IV and V for diesel HGVs to be introduced in 2000, 2005 and 2008). In relation to fuel quality, a recent EU Fuel Directive (98/70/EC) has introduced significant reductions in both sulphur and benzene content of fuels.

In relation to design and operational aspects of road developments, 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[12]. 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.

13.5.2 Climate

CO_2 emissions will be reduced to 120 g/km by 2012 through EU legislation. This measure will reduce CO_2 emissions from new cars by an average of 25% in the period 1995 to 2007/2009 whilst 15% of the necessary effort towards the overall climate change target of the EU will be met by this measure alone[18]. Additional fuel efficiency measures include VRT and Motor Tax rebalancing to favour the purchases of more fuel-efficient vehicles, the National Car Test and Fuel Economy Labelling[18,19].

13.6 Construction Impacts and Mitigation Measures

13.6.1 Local Construction Impacts

There is the potential for a number of emissions to the atmosphere during the construction of the development. In particular, the construction activities may generate quantities of dust. Construction vehicles, generators etc., will also give rise to some exhaust emissions.

There is the potential for a number of greenhouse gas emissions to atmosphere during the construction of the development. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions.

13.6.2 Predicted Impacts

If a satisfactory dust minimisation plan is implemented, the effect of construction on air quality will be slight.

13.6.3 Mitigation Measures to Reduce Adverse Effects

A dust minimisation plan will be formulated for the construction phase of the project, as construction activities are likely to generate some dust emissions (see Appendix A.2).

13.7 Forecasting methods

The air quality assessment has been carried out following procedures described in the publications by the EPA[20,21] and using the methodology outlined in the guidance documents published by the UK DEFRA [5-6,11-14].

Prediction of traffic derived pollutants was carried out using the UK DMRB Screening Model (Version 1.02 (Nov. 2003))[11] and following guidance issued by the UK DEFRA[12-14] and the EPA[20,21].

Pollutant	Regulation	Limit Type	Margin of Tolerance	Value
Nitrogen Dioxide	1999/30/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	40% until 2003 reducing linearly to 0% by 2010	200 µg/m^3 NO_2
		Annual limit for protection of human health	40% until 2003 reducing linearly to 0% by 2010	40 µg/m^3 NO_2
		Annual limit for protection of vegetation	None	30 µg/m^3 NO + NO_2
Lead	1999/30/EC	Annual limit for protection of human health	60% until 2003 reducing linearly to 0% by 2005	0.5 µg/m^3
Sulphur dioxide	1999/30/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	90 µg/m^3 until 2003, reducing linearly to 0 µg/m^3 by 2005	350 µg/m^3
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	None	125 µg/m^3
		Annual & Winter limit for the protection of ecosystems	None	20 µg/m^3
Particulate Matter Stage 1	1999/30/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	30% until 2003 reducing linearly to 0% by 2005	50 µg/m^3 PM_{10}
		Annual limit for protection of human health	12% until 2003 reducing linearly to 0% by 2005	40 µg/m^3 PM_{10}
Particulate Matter Stage 2[Note1]	1999/30/EC	24-hour limit for protection of human health - not to be exceeded more than 7 times/year	Not to be exceeded more than 28 times until 2006, 21 times until 2007, 14 times until 2008, 7 times until 2009 and zero times by 2010.	50 µg/m^3 PM_{10}
		Annual limit for protection of human health	50% from 2005 reducing linearly to 0% by 2010	20 µg/m^3 PM_{10}

Note 1 *EU 1999/30/EC states "Indicative limit values to be reviewed in the light of further information on health and environmental effects, technical feasibility and experience in the application of Stage 1 limit values in the Member States".*

Table 13.1 *Air Quality Standards Regulations 2002 (based on EU Council Directive 1999/30/EC)*

Pollutant	Regulation	Limit Type	Margin of Tolerance	Value
Benzene	2000/69/EC	Annual limit for protection of human health	100% until 2006 reducing linearly to 0% by 2010	5 µg/m^3
Carbon Monoxide	2000/69/EC	8-hour limit (on a rolling basis) for protection of human health	60% until 2003 reducing linearly to 0% by 2005	10 mg/m^3 (8.6 ppm)

Table 13.2 Air Quality Standards Regulations 2002 (based on EU Council Directive 2000/69/EC)

Pollutant	Regulation	Type	Period	Value
Nitrogen Dioxide	85/203/EEC	Limit Value	98th percentile of yearly mean hourly concentrations	200 µg/m^3
		Guide Value		135 µg/m^3
		Guide Value	50th percentile of yearly mean hourly concentrations	50 µg/m^3
Lead	82/884/EEC	Limit Value	Annual mean	2 µg/m^3
Sulphur dioxide	80/779/EEC	Limit Value	98th percentile of yearly mean hourly concentrations	250-350[Note1] µg/m^3
		Limit Value	Winter (medium of daily values)	130 or 180[Note1] µg/m^3
		Limit Value	One year (medium of daily values)	80 or 120[Note1] µg/m^3
		Guide Value	98th percentile of yearly mean hourly concentrations	135 µg/m^3
		Guide Value	50th percentile of 1-hour means	50 µg/m^3
Smoke	80/779/EEC	Limit Value	One year (medium of daily values)	80 µg/m^3
		Limit Value	Winter (medium of daily values)	130 µg/m^3
		Limit Value	98th percentile of daily values	250 µg/m^3

Note 1 *The lower daily values refer to the situation with corresponding high levels of black smoke.*

Table 13.3 Earlier European Union Air Standards

Pollutant	Averaging Period	Primary & Secondary Standard Note 1 ($\mu g/m^3$)	*PSD Increment Class II* Note2 ($\mu g/m^3$)
PM_{10}	Annual – Average over 3 years	50	17
	24-Hour – as a 99th%ile over 3 years	150	30
NO_2	Annual Mean	100	25
CO	8-Hour – 3-year average of annual 4th highest daily maximum 8-hour conc.	10,000	-
	1-Hour – not to be exceeded more than 3 times in 3 consecutive years	40,000	-
Hydrocarbon (Benzene)	3 Hours (6-9 AM) (corrected for methane)	160	-

Note 1 Primary standards to protect public health whilst secondary standards are set to protect public welfare
Note 2 Class I areas are national parks and similar areas. Class II are all areas not originally classified as Class I.

Table 13.4 *US National Ambient Air Quality Standards (NAAQS) & PSD Increments*

Substances	Time-weighted Average	Averaging Time
Lead	0.5 $\mu g/m^3$	1 year
Nitrogen dioxide	200 $\mu g/m^3$ 40-50 $\mu g/m^3$	1 hour annual
Carbon monoxide	100 $\mu g/m^3$ 60 $\mu g/m^3$ 30 $\mu g/m^3$ 10 $\mu g/m^3$	15 minutes 30 minutes 1 hour 8 hour
Benzene	Note 1	
Particulate matter (PM_{10})	Note 2	

Note 1 No safe level recommended owing to carcinogenicity.
Note 2 No specific guideline recommended because no obvious exposure concentration and duration that could be judged a threshold and decreased by uncertainty factors to avoid risk.

Table 13.5 WHO Air Quality Guidelines For Europe 2000

Degree of Impact	Definition
Profound	Exceedance of Alert Threshold as detailed in any EU Air Quality Directive or equivalent as assessed by detailed air quality modelling
Severe	Exceedance of any EU Air Quality Directive and Margin of Tolerance as assessed by detailed air quality modelling
Significant	Exceedance of EU Air Quality Directive (although below the Margin of Tolerance) and exceedance of PSD Increment as assessed by detailed air quality modelling
Moderate	Exceedance of EU Air Quality Directive (although below the Margin of Tolerance) but no exceedance of PSD Increment as assessed by detailed air quality modelling
Slight	Exceedance of Upper Assessment Threshold (although below the EU Air Quality Directive) and exceedance of PSD Increment as assessed by detailed air quality modelling
Imperceptible	Below the EU Air Quality Directive with no exceedance of PSD Increment as assessed by detailed air quality modelling
Slight Beneficial	Improvement to below the Upper Assessment Threshold as detailed in any EU Air Quality Directive by a margin greater than the PSD Increment as assessed by detailed air quality modelling
Moderate Beneficial	Improvement to below the EU Air Quality Directive as detailed in any EU Air Quality Directive by a margin greater than the PSD Increment as assessed by detailed air quality modelling

Table 13.6 *Criteria to Quantify the Potential Impact of Development*

Table 13.7 Criteria to Quantify the Potential Impact of Development – Specific Pollutant Guidance

Degree of Significance	Criteria (as assessed by detailed air quality modelling)	Carbon Monoxide (mg/m^3)	Benzene (µg/m^3)	Nitrogen Dioxide (µg/m^3)		Particulates (PM_{10}) (µg/m^3)	
		Maximum 8-hour[Note 1]	Annual mean[Note 1]	Maximum 1-hr NO_2[Note 2]	Annual average NO_2[Note 2]	Annual average[Note 2]	Maximum 24-hr values[Note 2]
Profound	Exceedance of Alert Threshold as detailed in EU Air Quality Directive	>20[Note 3]	>15[Note 3]	>400	>80[Note 3]	>80[Notes 3,4]	>100[Notes 3,4]
Severe	Exceedance of any EU Air Quality Directive and Margin of Tolerance	>15	>10	>300	>60	>48	>75
Significant	Exceedance of EU Air Quality Directive (although below the Margin of Tolerance) and exceedance of PSD Increment	>10 >2[Note 5]	>5.0 >1.3[Note 5]	>200 >50[Note 5]	>40 >10[Note 6]	>40 >13[Note 6]	>50 >10[Note 6]
Moderate	Exceedance of EU Air Quality Directive (although below the Margin of Tolerance) but no exceedance of PSD Increment	>10 <2[Note 5]	>5.0 <1.3[Note 5]	>200 <50[Note 5]	>40 <10[Note 6]	>40 <13[Note 6]	>50 <10[Note 6]
Slight	Exceedance of Upper Assessment Threshold (although below the EU Air Quality Directive) as detailed in any EU Air Quality Directive and exceedance of PSD Increment	>7 >2[Note 5]	>3.5 >1.3[Note 5]	>140 >50[Note 5]	>32 >10[Note 6]	>28 >13[Note 6]	>30 >10[Note 6]
Imperceptible	Below the EU Air Quality Directive as detailed in any EU Air Quality Directive with no exceedance of PSD Increment	<10 <2[Note 5]	<5.0 <1.3[Note 5]	<200 <50[Note 5]	<40 <10[Note 6]	<40 <13[Note 6]	<50 <10[Note 6]
Slight Beneficial	Improvement to below the Upper Assessment Threshold as detailed in any EU Air Quality Directive by a margin greater than the PSD Increment	<7 >2[Note 5]	<3.5 >1.3[Note 5]	<140 >50[Note 5]	<32 >10[Note 6]	<28 >13[Note 6]	<30 >10[Note 6]
Moderate Beneficial	Improvement to below the EU Air Quality Directive as detailed in any EU Air Quality Directive by a margin greater than the PSD Increment	<10 >2[Note 5]	<5.0 >1.3[Note 5]	<200 >50[Note 5]	<40 >10[Note 6]	<40 >13[Note 6]	<50 >10[Note 6]

Note 1 EU Council Directive 2000/69/EC

Note 2 EU Directive 1999/30/EC

Note 3 No alert threshold set – limit relative to the alert threshold for NO_2

Note 4 Alert threshold to be considered by end of 2003 – Council Directive 1999/30/EC

Note 5 No PSD Increment Available – based on average of other PSD increments

Note 6 Relative PSD Increment, USEPA Limit Values vary from EU Limits

Background Values	Nitrogen Oxides ($\mu g/m^3$)	Nitrogen Dioxide ($\mu g/m^3$)	Benzene ($\mu g/m^3$)	Particulates (PM_{10}) ($\mu g/m^3$)	Particulates ($PM_{2.5}$) ($\mu g/m^3$)	Carbon Monoxide (mg/m^3)
Year 2008	28	19	0.50	18	11	0.15
Year 2020 Note1	24	17	0.47	17	10	0.12

Note 1 Reduction in future years using the Netcen background calculator (November 2002).

Table 13.8 Summary of background concentrations used in the air dispersion model.

Table 13.9 Air Quality Assessment, Proposed Greenpark Commercial Development. Summary Of Predicted Air Quality At Worst-Case Receptors Near Courtbrack Avenue.

Scenarios	Traffic Speed (km/hr)	Carbon Monoxide (mg/m^3)		Hydrocarbons ($\mu g/m^3$)		Nitrogen Dioxide ($\mu g/m^3$)		Particulates (PM_{10}) ($\mu g/m^3$)	
		Annual Average	Maximum 8-hour	Annual mean benzene	Running annual mean benzene	99.8^{th}%ile of 1-hr NO_2	Annual average NO_2	Annual average	Number of exceedances of 50 $\mu g/m^3$
2008 Do-minimum	**10**	0.16	1.6	0.51	0.56	98	19.6	18.2	2
	40	0.15	1.5	0.50	0.55	97	19.3	18.1	1
2008 Do-something	**10**	0.16	1.6	0.51	0.56	98	19.6	18.2	2
	40	0.15	1.5	0.50	0.55	97	19.4	18.1	1
2020 Do-minimum	**10**	0.13	1.3	0.48	0.53	87	17.4	17.1	1
	40	0.12	1.2	0.47	0.52	86	17.2	17.1	1
2020 Do-something	**10**	0.13	1.3	0.48	0.53	87	17.4	17.1	1
	40	0.12	1.2	0.47	0.52	86	17.2	17.1	1
Standards		-	10 Note 1	-	5 Note 1	200 Notes 2,3	40 Note 2	40 Note 2	35 Notes 2,4

Note 1 EU Council Directive 2000/69/EC (S.I. 271 of 2002)
Note 2 EU Council Directive 1999/30/EC (S.I. 271 of 2002)
Note 3 1-hr limit of 200 $\mu g/m^3$ not to be exceeded > 18 times/year (99.8^{th} %ile)
Note 4 24-Hr limit of 50 $\mu g/m^3$ not to be exceeded > 35 times/year (90.1^{th} %ile)

Table 13.10 Air Quality Assessment, Proposed Greenpark Commercial Development. Summary Of Predicted Air Quality At Worst-Case Receptors Near The Dock Road.

Scenarios	Traffic Speed (km/hr)	Carbon Monoxide (mg/m^3)		Hydrocarbons ($\mu g/m^3$)		Nitrogen Dioxide ($\mu g/m^3$)		Particulates (PM_{10}) ($\mu g/m^3$)	
		Annual Average	Maximum 8-hour	Annual mean benzene	Running annual mean benzene	99.8^{th}%ile of 1-hr NO_2	Annual average NO_2	Annual average	Number of exceedances of 50 $\mu g/m^3$
2008 Do-minimum	**10**	0.37	3.7	0.76	0.84	149	29.8	23.2	9
	40	0.23	2.3	0.61	0.67	128	25.6	20.4	4
2008 Do-something	**10**	0.39	3.9	0.79	0.86	153	30.6	23.7	9
	40	0.23	2.3	0.62	0.68	131	26.1	20.6	4
2020 Do-minimum	**10**	0.27	2.7	0.60	0.66	110	22.0	18.8	2
	40	0.17	1.7	0.53	0.58	100	20.1	18.0	1
2020 Do-something	**10**	0.48	4.8	0.90	0.99	138	27.6	21.4	5
	40	0.25	2.5	0.65	0.72	119	23.9	19.3	3
Standards		-	10 Note 1	-	5 Note 1	200 Notes 2,3	40 Note 2	40 Note 2	35 Notes 2,4

Note 1 EU Council Directive 2000/69/EC (S.I. 271 of 2002)
Note 2 EU Council Directive 1999/30/EC (S.I. 271 of 2002)
Note 3 1-hr limit of 200 $\mu g/m^3$ not to be exceeded > 18 times/year (99.8^{th} %ile)
Note 4 24-Hr limit of 50 $\mu g/m^3$ not to be exceeded > 35 times/year (90.1^{th} %ile)

Table 13.11 Air Quality Assessment, Proposed Greenpark Commercial Development. Summary Of Predicted Air Quality At Worst-Case Receptors Proposed As Part Of The Development.

Scenarios	Traffic Speed (km/hr)	Carbon Monoxide (mg/m^3)		Hydrocarbons ($\mu g/m^3$)		Nitrogen Dioxide ($\mu g/m^3$)		Particulates (PM_{10}) ($\mu g/m^3$)	
		Annual Average	Maximum 8-hour	Annual mean benzene	Running annual mean benzene	99.8^{th}%ile of 1-hr NO_2	Annual average NO_2	Annual average	Number of exceedances of 50 $\mu g/m^3$
2008 Do-something	**10**	0.17	1.7	0.51	0.57	100	20.1	18.4	2
	40	0.16	1.6	0.51	0.56	98	19.6	18.2	2
2020 Do-something	**10**	0.31	3.1	0.70	0.77	116	23.2	19.3	3
	40	0.19	1.9	0.57	0.63	105	20.9	18.2	2
Standards		-	10 Note 1	-	5 Note 1	200 Notes 2,3	40 Note 2	40 Note 2	35 Notes 2,4

Note 1 EU Council Directive 2000/69/EC (S.I. 271 of 2002)

Note 2 EU Council Directive 1999/30/EC (S.I. 271 of 2002)

Note 3 1-hr limit of 200 $\mu g/m^3$ not to be exceeded > 18 times/year (99.8^{th} %ile)

Note 4 24-Hr limit of 50 $\mu g/m^3$ not to be exceeded > 35 times/year (90.1^{th} %ile)

Table 13.12 Air Quality Assessment, Proposed Greenpark Commercial Development. Summary Of Predicted Air Quality At Worst-Case Receptors Near The Dock Road.

Scenarios	Traffic Speed (km/hr)	Particulates ($PM_{2.5}$) ($\mu g/m^3$)	
		Annual average	Number of exceedances of 35 $\mu g/m^3$
2008 Do Minimum	**10**	16.2	0
2008 Do Something	**10**	16.7	1
2020 Do Minimum	**10**	11.8	0
2020 Do Something	**10**	14.4	0
Standards		12 –20 Notes 1,2	35 Notes 1,3

Note 1 European Commission sponsored report "Second Position Paper on Particulate Matter – draft for discussion" (21/08/03)

Note 2 Proposed annual limit value likely to be in the range 12 – 20 $\mu g/m^3$

Note 3 Proposed 24-Hr limit of 35 $\mu g/m^3$ not to be exceeded > 35 times/year in 2010 (90^{th} %ile)

Table 13.13 Air Quality Assessment, Proposed Greenpark Commercial Development. Summary Of Predicted Air Quality At Worst-Case Receptors Proposed As Part Of The Development.

Scenarios	Traffic Speed (km/hr)	Particulates ($PM_{2.5}$) ($\mu g/m^3$)	
		Annual average	Number of exceedances of 35 $\mu g/m^3$
2008 Do Something	**10**	11.4	0
2020 Do Something	**10**	12.3	0
Standards		12 –20 Notes 1,2	35 Notes 1,3

Note 1 European Commission sponsored report "Second Position Paper on Particulate Matter – draft for discussion" (21/08/03)

Note 2 Proposed annual limit value likely to be in the range 12 – 20 $\mu g/m^3$

Note 3 Proposed 24-Hr limit of 35 $\mu g/m^3$ not to be exceeded > 35 times/year in 2010 (90^{th} %ile)

CHAPTER FOURTEEN: INTERACTIONS WITH THE FOREGOING

14.1 Introduction

In addition to the requirement to describe the likely significant effects of the proposed development on particular aspects of the environment, there is also a requirement to consider the inter-action of those effects. In the Statement this is done by means of each aspect of the environment considered in the preceding parts of the Statement being cross-referenced against all of the other aspects considered.

As the retail planning application lodged as part of the overall masterplan has been withdrawn the overall impacts as outlined in a number of the chapters; specifically traffic, noise and air will be less due to the absence of this development factored into the study.

14.2 Interactions

Human Beings & Traffic

Pedestrians have been prioritised in the design of the Greenpark development and cycle ways have been provided. In addition, adequate parking has been provided for each element of the proposal.

Human Beings & Landscape

This will be a positive interaction as a significant amount of leisure amenities will be provided in this development for both active and passive recreation.
There will also be landscaping within the residential element of the scheme creating a soft edge to the developments.

Human Beings & Visual Impact of the Development

Only 4 of the 13 viewpoints examined will experience a negative impact and after the mitigating measures are installed only one viewpoint will have a high long term impact.

Human Beings & Flora / Fauna

A number of mitigation methods have been undertaken to ensure that the potential impacts of the development on the existing flora and fauna is minimised.

Human Beings & Archaeology / Cultural Heritage & Landscape

The events of historic importance at Greenpark such as the visit of Pope John Paul II will be commemorated as part of the development.

The layout of the residential element is designed to reflect historic resonances of the racecourse's history.

Any potential archaeological material on site will be recorded.

Human Beings & Noise

The proposed development will not result in any significant noise impacts on the nearby residents.

Human Beings & Air

The proposed development will not result in any significant impacts on air quality.

Traffic & Landscaping

The potential visual impact of the car park associated with the development will be mitigated by a sensitively designed landscaping plan.

Traffic & Noise

The resultant noise impact due to increase in traffic for this development is imperceptible and the resultant impact is not significant.

Traffic & Air

Pollutant levels from traffic at normal speed and at worst case peak hour speed are modelled as being below the relevant limit values.

Landscape & Flora / Fauna

The significant impact of the removal of the marsh orchid for residential development is mitigated by its relocation within the landscaping of the amenity area scheme.

The proposed wet woodland planting between the embankment and the southern ditch is viewed as a positive moderate ecological benefit to the cSAC.

The habitat provided by the attenuation pond more than compensates for the loss of drainage ditches on the site.

The open grassed areas in the amenity phase and the freshwater habitat will serve to enhance the existing resting and roosting possibilities for wintering bird species.

Flora / Fauna & Servicing

Once operational all surface and foul water will be adequately treated and as such will not present an ecological impact.

The change in drainage patterns will create new habitats on the site.

Soils & Flora / Fauna

A number of mitigation methods have been undertaken to ensure that the potential impacts of the development on the existing flora and fauna is minimised.

Traffic & Soils

The resultant traffic impact due to movement of soil for this development will be kept to a minimum. Infiling will take place over the initial stages of the development's implementation.

APPENDICES

Appendix A: Air

Appendix A1: Reference
Appendix A2: Ambient Air Quality Standards
Appendix A3: Air Dispersion Modelling
Appendix A3: Dust Minimisation Plan

Appendix B: Retail

Removed

Appendix C: Archaeology

Appendix C1: Limerick City History
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Appendix D: Flora and Fauna

Appendix D1: Reference
Appendix D2: Floral Species List
Appendix D3: Bat Brick
Appendix D4: Suggested Planting List

Appendix E: Traffic

Appendix E1: Traffic Figures

Appendix F: Traffic – Further Information

Appendix F1: Traffic Extract of Submission to Limerick City Council

Appendix G: Traffic – Clarification of Further Information

Appendix G1: Traffic Extract of Submission to Limerick City Council

Appendix A: Air

Appendix A1: Reference

(1) Framework Convention on Climate Change Ireland - Report on the in-depth review of the second national communication of Ireland (1999)
(2) Framework Convention on Climate Change Kyoto Protocol To The United Nations Framework Convention On Climate Change (1997)
(3) EPA Environment In Focus (2002)UK DEFRA (2003) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM. PG(03)
(4) ERM Limitation and Reduction of CO_2 and Other Greenhouse Gas Emissions in Ireland (1998)
(5) UK DEFRA (2003) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM. TG(03)
(6) UK DETR (1998) Preparation of Environmental Statements for Planning Projects That Require Environmental Assessment – A Good Practice Guide, Appendix 8 – Air & Climate
(7) Environmental Protection Agency (2001) Preliminary Assessment Under Article 5 of Council Directive 96/62/EC - Ireland
(8) Dublin Corporation (2003) Air Monitoring Report 2001
(9) Environmental Protection Agency (2003) Air Quality Monitoring Report 2002 (& previous annual reports 1997-2001)
(10) Environmental Protection Agency (2000) Ambient Air Monitoring in Limerick City
(11) UK DEFRA (2003) Design Manual for Roads and Bridges Vol 11 Chapter 3 (Spreadsheet)
(12) UK DEFRA (2000) Air Quality & Transport, LAQM.G3(00)
(13) UK DEFRA (2002) UK Air Quality Modelling for Annual Reporting 2001 on Ambient Air Quality Assessment under Council Directives 96/62/EC and 1999/30/EC (AEAT/ENV/R/1221)
(14) UK DEFRA (2001) DMRB Model Validation for the Purposes of Review and Assessment
(15) World Health Organisation (2000) Air Quality Guidelines For Europe
(16) UK Air Quality Monitoring Archive Website (2004) http://www.aeat.co.uk/netcen/airqual/
(17) Lawrence Berkley Laboratory (1995) A Preliminary Multi-City Assessment of the Impacts of Increased Urban Albedo and Vegetation on Regional Meteorology and Energy (Report No. LBL-37887)
(18) Department of Environment & Local Government National Climate Change Strategy (2000)
(19) Department of Environment & Local Government Progress Report On The Implementation of The National Climate Change Strategy (2002)
(20) EPA (2002) Guidelines On Information To Be Contain in Environmental Impact Statements
(21) EPA (2003) Advice Notes On Current Practice (In The Preparation Of Environmental Impact Statements)

Appendix A2: Ambient Air Quality Standards

National standards for ambient air pollutants in Ireland have generally ensued from Council Directives enacted in the EU (& previously the EC & EEC) (see Table 13.1 – 13.3). 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, has been 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. Council Directive 1999/30/EC, as relating to limit values for sulphur dioxide, nitrogen dioxide, lead and particulate matter, is detailed in Table 13.1. 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, started to reduce from 1 January 2003 and reduces every 12 months thereafter by equal annual percentages to reach 0% by the attainment date. A second daughter directive, EU Council Directive 2000/69/EC, has recently published limit values for both carbon monoxide and benzene in ambient air as set out in Table 13.2. This has also been passed into Irish Law under the Air Quality Standards Regulations 2002.

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 96/62/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 96/62/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 96/62/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 96/62/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. These various thresholds have been incorporated into the significance criteria for the development and will be appropriate for assessing the significance of the combined impact of the development plus the background environment.

An annual average limit for both NOx (NO and NO_2) is applicable for the protection of vegetation in highly rural areas away from major sources of NOx such as large conurbations, factories and high road vehicle activity such as a dual carriageway or motorway. Annex VI of EU Directive 1999/30/EC identifies that monitoring to demonstrate compliance with the NOx 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 16 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, among other factors, on 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 A3: Air Dispersion Modelling

The inputs to the DMRB model consist of information on road layouts, receptor locations, annual average daily traffic movements, annual average traffic speeds and background concentrations[(11)]. Using this input data the model predicts ambient ground level concentrations at the worst-case sensitive receptor using generic meteorological data.

The DMRB has recently undergone an extensive validation exercise[(14)] 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 DEFRAs 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[(14)].

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 ±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[(14)].

Appendix A4: Dust Minimisation Plan

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 several hundred metres of the construction area.

In order to ensure that no dust nuisance occurs, a series of measures will be implemented. Site roads shall be regularly cleaned and maintained as appropriate. 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 speed restricted, and this speed restriction must be enforced rigidly. Indeed, on any un-surfaced site road, this shall be 20 km per hour, and on hard surfaced roads as site management dictates. Vehicles delivering material with dust potential shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust.

All vehicles exiting the site shall make use of a wheel wash facility, preferably automatic, 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.

Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind. Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods.

Furthermore, during movement of the soil 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, the procedures put in place will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, satisfactory procedures will be implemented to rectify the problem.

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 practise and procedures.

Appendix B: Retail

An assessment of the retail impact of the overall development was carried out and included in the initial EIS submitted to the Council. This reflected the proposed retail development that was subject to an application that is now withdrawn.

This has now been withdrawn and it is considered no longer necessary to present a retail impact element as part of this EIS.

Appendix C: Archaeology

Background History for Limerick City

Foundations

The origins of Limerick City lie in the tenth-century development of a Norse settlement on the island now known as King's Island (Killanin and Duignan 1967, 349; Spellissy 1998, 17). This settlement grew to become the pre-eminent Hiberno-Norse centre in the region, with considerable support from the O'Briens of Thomond, and was later to become a focal point for Anglo-Norman settlement. The city received its first charter in 1197 from Prince John (Killanin and Duignan 1967, 350).

The Medieval "Twin Towns"

The medieval city resembled an hourglass in plan and the two parts, termed the Englishtown Irishtown, and were separated by the Abbey River. The Englishtown occupied the south-western part of King's Island, while the Irishtown lay across Baal's Bridge to the southeast. It is probable that the Irishtown was originally a suburb of the earlier English town, created by the native Irish who were moved out of the English town when the Anglo-Normans took control (Thomas 1992). King John's Castle was built on the western side of the Englishtown in the early thirteenth century (Thomas 1992, 142; Killanin and Duignan 1967, 351). McNeill (1997,46) notes that the Pipe Roll of 1211-12 records the expenditure of £733-16-11 on the castle, a very substantial sum at the time. The castle was an important part of the city defences, which developed over the following centuries, most notably with murage grants in 1237 and 1310-11. The city walls were maintained by grants up to the seventeenth century and Thomas (1992, 146), notes that twelve gates or posterns, the walls of both parts of the city, four drawbridges and two stone bridges were still being maintained in 1637.

The ecclesiastical development of the city played an important part in the growth of the urban centre, most notably in the Englishtown, and, in addition to St. Mary's Cathedral, foundations included a Augustinian priory off Bishop Street in 1172, a Dominican priory nearby in 1227 and a Franciscan friary outside the south-eastern wall of the Englishtown in 1267 (O'Rahilly 1995, 168-71).

The Irish town part of the city was walled in the period between AD1310 to AD1495 and enclosed an area of twenty-seven and a half acres (Clarke 1995, 172). It had a Y-shaped street plan, with Mungret Street, Broad Street/John's street being the main thoroughfares. From the evidence it appears that the buildings in the Irish town were focused on these streets and that the remainder of the land enclosed by the walls was probably gardens and paddocks (Bradley et al. 1989).

The city of Limerick, as noted above, was the most important Hiberno-Norse centre in the region and this status was not diminished with the development of the Anglo-Norman city. Killanin and Duignan note that the city had fifteen churches at the time of the Reformation (1967, 350). The city of Limerick is, perhaps, most famous as a city of sieges and as the 'City of the Broken Treaty'. In 1642 the city was captured by Confederate Catholic forces after a siege and was later taken by Cromwellian troops after a three-month siege in 1651.

The Sieges of the seventeenth century

The Williamite wars, which ranged over much of the country towards the close of the seventeenth century and had considerable international dimensions, also played a large role in the history of the Limerick region. The first Williamite siege took place after the battle of the Boyne in 1690, when the Jacobite forces regrouped inside the medieval defences of the city and successfully resisted the three-week siege by King William of Orange, who apparently had between 20,000 and 26,000 men at his disposal.

The second Williamite siege took place the following year and the city fell after one month, a French fleet arriving too late to be of assistance to the defenders. The Treaty of Limerick allowed the Jacobite soldiers to leave for France and gave basic rights to the remaining Catholic population. The leader of the Jacobite forces in Limerick, Patrick Sarsfield, was under pressure to renew the battle when the French reinforcements arrived, but would not breach the treaty which had been signed and left with 19,000 troops, "the Wild Geese" to form the Irish Brigade in France. The terms of the treaty were soon

breached, however, by the Williamite forces and the Catholic population was subjected to many discriminatory laws (Killanin and Duignan 1967, 350-1; Spellissy 1998, 49-62).

The sieges have also left their mark on the potential archaeological record of Limerick City. The proposed site is directly outside the line of defences that would have fortified the south-western portion of Irish Town in the seventeenth century and later. From the cartographic evidence and contemporary accounts of these defences it would appear that they were substantial. The legacy of those defences was ingrained in the former name of Cathedral Place, when it was called Rampers Road, after the ramparts of the Irish town, which it ran along. Those ramparts, while providing protection to the town also became a popular promenade for the townspeople (Thomas 1992). Indeed some of the cartographic representations of this period so a second line of defence for the city to the southwest, being the Irishtown and the site in question. There precise location of the ground is still unknown, although it may be postulated that they were positioned in the Mount Kennett/O'Connell Avenue part of the present city (figure C1).

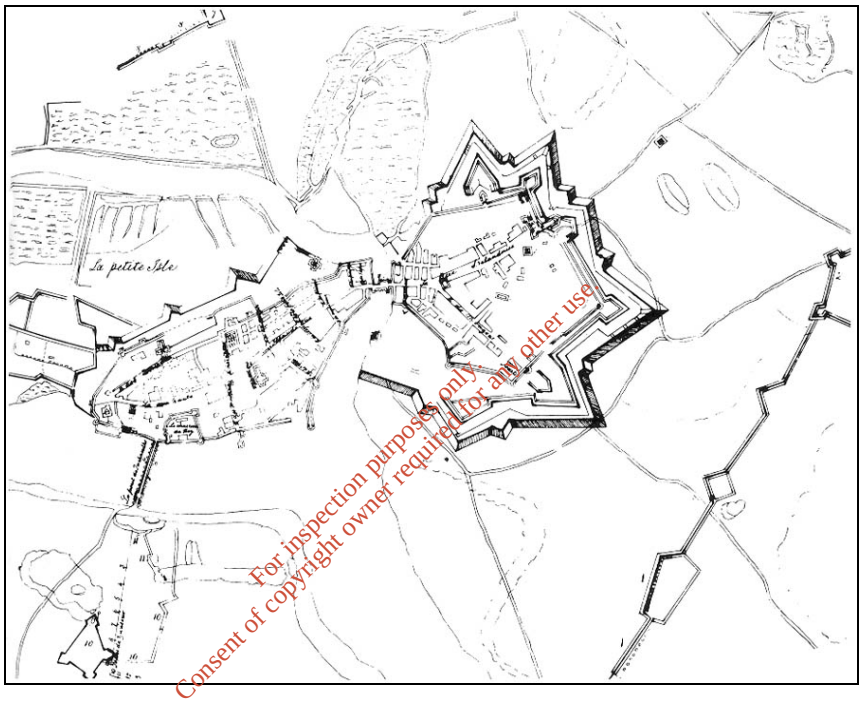


Figure C1: 1691 "French" map north to left note outlying defences at bottom right of map, site in question situated off right of this map (Hill 1991; with additions)

Resurgence of the Eighteenth Century

During the eighteenth century, Limerick overcame the difficulties caused by the Williamite wars and began to regain its prosperity. Many civic buildings were repaired or rebuilt and brick became a common building material, particularly in the construction of the many Dutch-gabled houses which were built in the city at the time. These unusual buildings, some of which survived in Mary Street in the early twentieth century (Hill 1991, 62-5), are testimony to the Continental influences and Dutch links which the city enjoyed in the late seventeenth and early eighteenth centuries.

Between 1751 and 1756 Edmund Sexton Pery, with John Purdon, developed a square of stone built buildings just inside St John's Gate. These houses represented a new architectural style, resulted in the demolition of the city walls to allow rear access and initiated a dramatic period of expansion (Clarke 1995, 181). The growing prosperity of the city created a need for considerable expansion beyond the limits of the medieval town walls and a new area of the city was developed to the southwest of Irishtown. This was the Newtown or Newtown Pery, and was developed in the later eighteenth and early nineteenth centuries in the Georgian style (O'Flaherty 1995, 181-3). The streets were laid out on a grid pattern and the commercial centre of the city gradually shifted closer to this area of elegant Georgian townhouses, the smaller streets of the medieval core becoming less important over time.

New Town Pery

New Town Pery was a part of the city that was designed and developed to the south and west of the old quarters of English and Irish towns. The first plans for the new suburb of the town were drawn up in the 1770s, and by 1787, Bank Place, Rutland Street and the development of Arthur's Quay, Francis Street and Patrick Street had been built. This was the first recognisable Georgian district in the city and is important in that they were not undertaken by Pery, but by the Arthurs and the Roches.

It was not until the early 1880s that the building began in earnest (Hill 1991, 91, O' Flaherty 1995, 183). The town was set up on a grid and block system and this was important in maintaining a sense of architectural unity in the development, despite the fact that the new town was not the work of a single landlord or architect. The ground on which it was built was wholly over elevated ground and parallel to the river. The land was originally the South Prior's Estate but had been acquired by Pery, after whom the town was named (Lewis 1837, 268). Pery had large portions of the new town leased by the nineteenth century. This new town had precincts for the wealthy merchants to live and it was from the late 1790s that Limericks merchants and other businessmen began to invest in plots of land on a large scale. Manufactories and stores were also intermingled with the private villas, so they could oversee their businesses, at close quarters. The blocks drawn on the original 1770s plan formed the basic measurement and these were either leased in a single block, a series of blocks, or they could be sub-divided as these equally sized units encompassed several houses.

In the 1800s new quays were developed in the Newtown Pery area of the city. It appears that by 1823 these quays were functioning (Hill 1991, 117). Wealthy inhabitants of the locality constructed them, the quays being named after their owners, such as: Harvey, Russell, Spaight, Arthur and Kelly (now steam boat quay) (Spellissey 1989, 50). The Government however, had no input into these quays and many fell into disrepair as a result, despite provisions in the leases of riverside plots for the maintaining of quays (Hill 1991, 106). The ground and riverbed at this point was very rugged and hard and the vessels that did dock there were frequently damaged (Lewis 1837, 270).

The success of the development was clear, for the centre of the city moved southwards from the 1770s as more and more residential and commercial buildings were established in the Newtown. This movement of the wealthy citizens and businessmen, port and industry meant that the English town fell into decline in the nineteenth century and many of the public buildings were subsequently relocated to the newer parts of town. Despite the decline the majority of the working population of the city continued to inhabit what is now called King's Island until into the twentieth century.

The relocation of the wealthy and influential resulted in a corresponding pattern of church building in the new town to follow population movements. The most substantial of these was the planned construction of a massive octagon shaped church, which was to form the centrepiece of the new town. Rev. James White recorded that in 1767 the construction of the streets and squares of Newtown Pery was in full progress and that in the centre of four streets they were building a church in octagon form to which the government contributed £500 (Hill 1991, 108). This location has been identified as the crossing between Bedford Row and Thomas Street, which was originally a square. This church was never completed and the materials were later used in the construction of St George's chapel, located on George's Street (now O'Connell Street).

It had been noted that the development of Newtown Pery was being developed primarily by its wealthy citizens and merchants, unhindered by the priorities of the Limerick City Corporation, and Newtown was not incorporated into the City of Limerick administration until 1853. This loss of administrative dependence was important in that the Newtown area now had to be allocated resources along with the rest of the city and with the post-famine fall in economic growth the Newtown began to decline. Limerick at its height was described as an impressive sight and was frequently compared to London. The construction of Newtown Pery with its impressive Georgian buildings has resulted in Limerick having markedly different architectural styles and this could not be more evident than in the architecture of the Newtown area of the city compared with the older medieval Irish and English towns, much of which have been subsequently demolished and redeveloped in recent years. This has left the City of Limerick with a central core of Georgian architecture surrounded by modern redevelopment and expansion.

Project References

1962 *Geological Map of Ireland*. Dublin: Geological Survey of Ireland.

1984 *Index to the Townlands and Towns, Parishes and Baronies of Ireland, from the census of 1851.* Baltimore: Genealogical Publishing Company.

Aalen, F.H.A., Whelan, K. and Stout, M.. *1997* *Atlas of the Irish Rural Landscape.* Cork: University Press.

Archaeological Survey of Ireland 1997 *RMP constraint maps (sheet 5 and 13) and List for County Limerick*. Dublin: The Stationary Office.

Barry, T. B. 1987 *The Archaeology of Medieval Ireland*. London: Routledge.

Begley, Rev. J. 1906 (1993 rep) *The Diocese of Limerick: Ancient and Medieval,* Dublin: Browne & Nolan Ltd.

Bence-Jones, M. 1988 *A Guide to Irish Country Houses*. London: Constable.

Bradley, J and Halpin, A and King, H. 1985 Urban Archaeology Survey : Limerick. Dublin: OPW Unpublished report.

Coiste Oideachais Muinteoiri Luimnigh.(nd) *Limerick – A Handbook of Local History*, Limerick: Treaty Press Ltd.

Coyne, F. 2001 Excavation of a "Plectrum-shaped" enclosure at Newtown Co. Limerick. Unpublished report.

Edwards, N. 1990 *The Archaeology of Early Medieval Ireland*. London: BT Batsford Ltd.

Environmental Protection Agency 1995a *Draft guidelines on the information to be contained in Environmental Impact Statements*. Dublin: Environmental Publications.

Environmental Protection Agency 1995b *Advice Notes on current practice.* Dublin: Environmental Publications

Environmental Protection Agency 2002 *Guidelines on the information to be contained in Environmental Impact Statements*. Dublin: Environmental Publications.

Ferrar, J. 1787 *The History of Limerick.* Limerick: A Watson & Co.

Fitzgerald and McGregor 1826 *The History Topography and antiquities of the county and city of Limerick.* Limerick: McKern.

FitzMaurice Mills, J. 1987 *The Noble Dwellings of Ireland*. London: Thames and Hudson.

Hill, J. 1991 *The Building of Limerick*. Ireland. Mercier Press.

Joyce, G. 1995 *Limerick City Street Names* Limerick: Leader Press.

Kenny, J. & Walsh, L. 1997 *Limerick in Old Picture Postcards*, Netherlands: European Library.

Killanin, M.A. & Duignan, M.V. 1967 *The Shell Guide to Ireland*. London: Edbury Press.

Lenihan, M. 1886 (1991 repr.) *Limerick: Its History and Antiquities*, Cork: Mercier Press.

Lewis, S. 1837 *A Topographical Dictionary of Ireland*, London: Lewis & Sons.

Limerick City Council 2004 Limerick City Development Plan Draft.

National Coastal Survey 1995 *Counties Limerick and Clare CD Number 5.* Dublin: The Marine Institute.

O' Carroll, C.(ed). 1990 *1890, Dowd's History of Limerick*, Dublin: O' Brien Press.

O'Conor, K.D. 1998 *The Archaeology of Medieval Rural Settlement in Ireland*. Discovery Programme Monograph Dublin: The Royal Irish Academy.

O'Donovan, J. 1840a *OS Letters for county Limerick, 3 vols*. Bray

O'Donovan, J. 1840b *OS Name Books County Limerick, three volumes*. Bray.

O'Kelly, M.J. 1989 *Early Ireland*. Cambridge: Cambridge University Press.

O'Rahilly, C. 1995 Medieval Limerick: The growth of two towns, in H.B. Clarke (ed) *Irish Cities.* Cork: Mercier.

O'Sullivan, A. 2001 *Foragers, Farmers, and Fishers in a coastal landscape. Discovery Programme Monographs 5, North Munster project*. Dublin: RIA.

Ordnance Survey 1840-1938 *Six inch maps for County Limerick, sheets 5 and 13; two editions*. Dublin: Ordnance Survey of Ireland.

Ordnance Survey 1996 *Discovery Series map for County Limerick numbers 65*. Dublin: Ordnance Survey of Ireland.

Simington, R.C. (ed.) 1934 *The Civil Survey 1654-6, volume iv, County Limerick*. Dublin: The Stationery office.

Spellissy, S 1998 *The History of Limerick*. Limerick: The Celtic Bookshop.

Spellissy, S. 1989 *Limerick The Rich Land*. Ennis: Spellissy-O'Brien.

Stout, M. 1997 *The Irish Ringfort.* Dublin: Four courts press.

Thomas, A. 1992 *The Walled Towns of Ireland* 2 volumes, Dublin: IAP.

Waddell, J. 1998 *The Prehistoric Archaeology of Ireland*. Galway: Galway University Press.

Appendix D: Flora and Fauna

D1: REFERENCES

Curtis, T.G.F. & McGough, H.N. (1988) *The Irish Red Data Book. 1. Vascular Plants.* The Stationery Office, Dublin.

Dúchas Site Synopsis: Site 002165 Shannon Estuary

European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94 of 1997).

Fossitt, J.A. (2000) *A Guide to Habitats in Ireland*. The Heritage Council.

Joint Nature Conservancy Council (1993) *Phase I Habitat Survey Techniques.* JNCC.

Scannell, M.J.P & Synnott, D.M. (1987) *Census catalogue of the flora of Ireland. (2nd Ed.)*. Stationery Office, Dublin.

Webb, D.A., Parnell, J. and Doogue, D. (1996) *An Irish Flora*. Dundalgan Press, Dundalk.

Wildlife (Amendment) Act, 2000 (S.I. No. 38 of 2000)

APPENDIX D2: Floral Species lists

FW4 Drainage ditches

Alnus glutinosa	Alder
Alsima plantago aquatica	Water plantain
Angelica sylvestris	Wild angelica
Anthriscus sylvestris	Cow parsley
Apium nodosum	Fool's watercress
Asplenium scolopendrium	Hart's-tongue
Callitriche stagnalis	Starwort
Calystegia sepium	Hedge bindweed
Carex acutiformis	Lesser pond sedge
Carex otrurae	False fox sedge
Cirsium palustre	Marsh thistle
Cirsium vulgare	Spear thistle
Crataegus monogyna	Hawthorn
Crepis spp.	Hawkbead
Dactylis glomerata	Cocksfoot
Dactylorrhiza fuschi subsp. *okellyi*	Marsh orchid
Deschampsia caespitosa	Tufted hairgrass
Dipascus fullonum	Teasel
Eleocharis palustris	Common spike-rush
Elodea Canadensis	Canadian pondweed
Enteromorpha intestinalis	Gutweed
Epilobium palustre	Marsh willowherb
Equisetum fluivitale	Horsetail
Equisetum palustre	Horsetail
Festuca arundinacea	Tall fescue
Filipendula vulgaris	Meadowsweet
Galium aparine	Cleavers
Galium palustre	Cleavers
Geranium robertianum	Herb-Robert
Glyceria fluitans	Floating sweetgrass
Hedera helix	Ivy
Holcus lanatus	Yorkshire fog
Holcus mollis	Creeping soft grass
Iris pseudacorus	Flag iris
Juncus articulatus	Jointed rush
Juncus bufonis	Toad rush
Juncus effuses	Soft rush
Lathyrus pratensis	Meadow vetchling
Lemna minor	Duckweed
Lolium perenne	Perennial ryegrass
Lotus corniculatus	Bird's foot trefoil
Mentha aquatica	Water mint
Myosotis scorpiodes	Forget me-not
Myoston aquaticum	Chickweed
Petastis hybridus	Butterbur
Phleum pratense	Timothy
Phragmites australis	Common reed
Phyllitis scolopendrium	Hart's-tongue
Poa annua	Annual meadow grass
Potentilla anserine	Silverweed
Prunella vulgaris	Selfheal
Ranunculus ficaria	Lesser celandine
Ranunculus repens	Creeping buttercup
Rubus fruticosus agg.	Bramble

Salix caprea	Goat willow
Salix cinerea	Grey willow
Salix fragilis	Crack willow
Salix viminalis	Osier
Sambucus nigra	Elder
Scrophularia nodosa	Common figwort
Sparganium erectum	Branched bur reed
Sphagnum spp.	Moss
Stellaria media	Chickweed
Trifoium repens	White clover
Trifolium pratense	Red clover
Urtica dioica	Common nettle

GS4 WET GRASSLAND

Alopecurus pratensis	Meadow foxtail
Anthoxanthum odoratum	Sweet vernal grass
Bellis perennis	Daisy
Calystegia sepium	Hedge bindweed
Carex flacca	Glaucous sedge
Carex nigra	Common sedge
Centaura nigra	Knapweed
Cirsium arvense	Creeping thistle
Cirsium palustre	Marsh thistle
Cirsium vulgare	Spear thistle
Conopodium majus	Pignut
Crepis spp.	Hawksbead
Dactylis glomerata	Cock's foot
Deschampsia caespitosa	Tufted hairgrass
Eleocharis palustris	Common spike-rush
Elymus repens	Couch grass
Epilobium angustifolium	Rosebay willowherb
Equisitium fluviatale	Horsetail
Filipendula vulgaris	Meadowsweet
Galium aparine	Cleavers
Galium palustre	Marsh bedstraw
Holcus lanatus	Yorkshire fog
Holcus mollis	Creeping soft grass
Hypochoeris radicata	Cat's ear
Iris pseudacorus	Yellow iris
Juncus articulatus	Jointed rush
Juncus effuses	Soft rush
Juncus inflexus	Hard rush
Leucanthemum vulgare	Ox-eye daisy
Lolium multiflorum	Italian ryegrass
Lolium perenne	Perennial rye-grass
Lotus corniculatus	Bird's foot trefoil
Lythrum salicaria	Purple loosestrife
Medicago lupulina	Black medick
Mentha aquatica	Water mint
Molinia caerula	Purple moor grass
Myosotis scorpiodes	Forget me-not
Myoston aquaticum	Chickweed
Papaver rhoeas	Poppy
Phleum pratense	Timothy
Plantago lanceolata	Ribwort plantain
Plantago major	Greater plantain

Poa annua	Annual meadow grass
Poa trivialis	Rough meadow grass
Potentilla anserina	Silverweed
Potentilla erecta	Tormentil
Potentilla reptans	Creeping cinquefoil
Prunella vulgaris	Selfheal
Ranunculus acris	Meadow buttercup
Ranunculus repens	Creeping buttercup
Rubus fruticosus agg.	Bramble
Rumex acetosa	Common sorrel
Rumex obtusifolius	Broad-leaved dock
Scrophularia nodosa	Common figwort
Scutellaria minor	Lesser skullcap
Senecio jacobaea	Ragwort
Senecio vulgaris	Groundsel
Sphagnum spp.	Moss
Stachys plaustris	Marsh woundwort
Stellaria media	Common chickweed
Stellaria uliginosa	Bog stitchwort
Succisa pratensis	Devil's bit
Taraxacum agg.	Dandelion
Trifolium pratense	Red clover
Trifolium repens	White clover
Urtica dioica	Common nettle
Veronica chamaedrys	Germander speedwell
Vicia cracca	Tufted vetch
Vicia sativa	Common vetch

WL1 Hedgerows

Acer pseudoplatanus	Sycamore
Agrostis stolonifera	Creeping bent
Alnus glutinosa	Alder
Anthriscus sylvestris	Cow parsley
Asplenium scolopendrium	Hart's tongue fern
Avena fatua	Wild oats
Betula pendula	Silver birch
Betula pubescens	Downy birch
Calystegia sepium	Hedge bindweed
Chamaecyparis Lawsonii	Lawson's cypress
Cirsium vulgare	Thistle
Crataegus monogyna	Hawthorn
Cytisus scoparius	Broom
Dactylis glomerata	Cock's foot
Elymus repens	Couch grass
Epilobium angustifolium	Rosebay willowherb
Epilobium montanum	Broad-leaved willowherb
Eucalyptus spp.	Eucalyptus
Fraxinus excelsior	Ash
Galium aparine	Cleavers
Geranium robertianum	Herb-Robert
Hedera helix	Ivy
Heracleum spondylium	Hogweed
Holcus lanatus	Yorkshire fog
Lollium perenne	Perennial ryegrass
Lonicera periclymenum	Honeysuckle
Phalaris arundinacea	Reed canary grass
Phleum pratense	Timothy

Phragmites australis	Common reed
Picea sitchensis	Sitka spruce
Poa annua	Annual meadow grass
Polystichum setiferum	Hard fern
Potentilla erecta	Tormentil
Prunus spinosa	Blackthorn
Ranunculus acris	Meadow buttercup
Ranunculus repens	Creeping buttercup
Rosa canina	Dog rose
Rubus fruticosus agg.	Bramble
Rumex obtusifolius	Broad-leaved dock
Salix cinerea	Grey willow
Salix fragilis	Crack willow
Salix fragilis	Osier
Sambucus nigra	Elder
Sisymbrium officionale	Hedge mustard
Skimmia spp.	Skimmia
Taraxacum spp.	Dandelion
Tussilago farfara	Colts foot
Ulex europaeas	Gorse
Ulex gallii	Gorse
Ulmus spp.	Elm
Urtica dioica	Common nettle
Vicia sepium	Bush vetch

WL2 TREELINE

Cupressocyparis leylandii	Leyland cypress
Ligustrum spp.	Privet

ED3 Recolonising Bare Ground

Anagalis arvensis	Scarlet pimpernel
Arctium minus	Burdock
Avena fatua	Wild oat
Bellis perennis	Daisy
Brassica rapa	Wild turnip
Carex remota	Remote sedge
Cirsium arvense	Creeping thistle
Cirsium vulgare	Spear thistle
Crepis spp.	Hawksbead
Dipascus fullonum	Teasel
Epilobium angustifolium	Rosebay willowherb
Epilobium hirsutum	Great willowherb
Epilobium montanum	Broad leaved willowherb
Equisitium fluviatale	Horsetail
Galium aparine	Cleavers
Holcus lanatus	Yorkshire fog
Juncus effuses	Soft rush
Leucanthemum vulgare	Ox-eye daisy
Ligustrum spp.	Privet
Lollium perenne	Perennial ryegrass
Lotus corniculatus	Bird's foot trefoil
Matricaria matricarioides	Pineappleweed
Medicago lupulina	Black medick
Papaver rhoeas	Poppy
Phragmites australis	Common reed

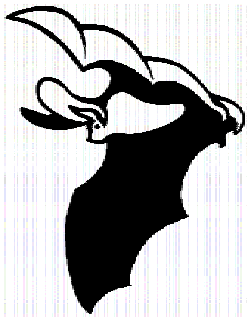
Plantago lanceolata	Ribwort plantain
Plantago major	Greater plantain
Poa annua	Annual meadow grass
Polygonium aviculare	Knotweed
Polygonium persicaria	Redshank
Potentilla reptans	Creeping cinquefoil
Prunella vulgaris	Self heal
Ranunculus repens	Creeping buttercup
Rubus fruticosus agg.	Bramble
Rumex conglemeratus	Dock
Salix alba	White willow
Scrophularia nodosa	Common figwort
Senecio jacobaea	Ragwort
Stellaria media	Common chickweed
Taraxacum spp.	Dandelion
Trifolium pratense	Red clover
Trifolium repens	White clover
Tripleurospermum inodorum	Scentless mayweed
Tussilago farfara	Colts foot
Veronica chamaedryas	Germander speedwell
Vicia cracca	Common vetch

BL2 Earth banks

Anagalis arvensis	Scarlet pimpernel
Bellis perennis	Daisy
Calystegia sepium	Hedge bindweed
Carex acutiformis	Lesser pond sedge
Carex remota	Remote sedge
Cirsium arvense	Creeping thistle
Cirsium vulgare	Spear thistle
Crepis spp.	Hawksbead
Dactylis glomerata	Cocksfoot
Dipascus fullonum	Teasel
Elymus repens	Couch grass
Epilobium hirsutum	Great willowherb
Equisitium fluviatale	Horsetail
Filipendula vulgaris	Meadowsweet
Galium aparine	Cleavers
Holcus lanatus	Yorkshire fog
Iris pseudacorus	Yellow iris
Juncus effuses	Soft rush
Juncus inflexus	Hard rush
Lollium perenne	Perennial ryegrass
Lotus corniculatus	Bird's foot trefoil
Matricaria matricarioides	Pineappleweed
Medicago lupulina	Black medick
Papaver rhoeas	Poppy
Phragmites australis	Common reed
Plantago lanceolata	Ribwort plantain
Plantago major	Greater plantain
Poa annua	Annual meadow grass
Polygonium aviculare	Knotweed
Prunella vulgaris	Self heal
Ranunculus repens	Creeping buttercup
Rubus fruticosus agg.	Bramble
Rumex acetosa	Sorrel
Salix alba	White willow

Salix capea	Goat willow
Salix cinerea	Grey willow
Scrophularia nodosa	Common figwort
Senecio jacobaea	Ragwort
Senecio vulgaris	Groundsel
Stellaria media	Common chickweed
Taraxacum spp.	Dandelion
Trifolium pratense	Red clover
Trifolium repens	White clover
Tussilago farfara	Coltsfoot
Urtica dioica	Common nettle

APPENDIX D3: Bat Brick



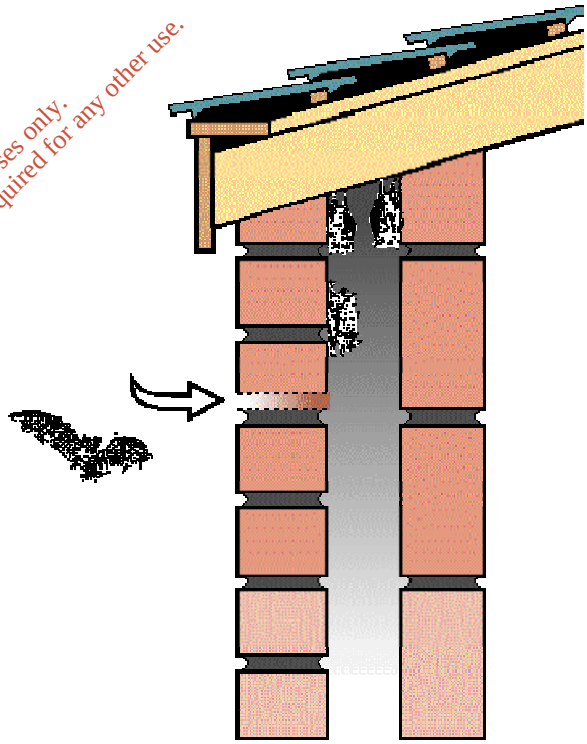
Bat Access and
Bat Roost Bricks

Over recent years Marshalls Clay Products has become almost as well known for the success of its award winning environmental work as it is for the quality of its brick products. Our land restoration and nature conservation schemes, first developed by Yorkshire Brick Company, have become an integral part of our activities over the years and have been recognised as some of the most successful of their kind anywhere. As part of this ongoing philosophy, Marshalls Clay Products have been producing a special Bat Access Brick, specially designed to help the country's badly depleted bat population by providing access to wall cavities or roof spaces where most bat colonies tend to be. (see diagram)

In recent years bats have been declining at an alarming rate, (estimates suggest as much as 60%) loss of habitat being a key factor in this decline. Nearly all colonies tend to be on the outside of houses, in wall cavities, under slates, flashing or tiles, etc.

Marshall's Bat Access Brick (also available in stone)

Contrary to popular opinion bats do not make nests and do absolutely no damage to buildings or roof timbers, indeed many people encourage bat colonies in their area because of the large number of insect pests, woodworm, etc. which they eat. Most colonies will use a house for only a few weeks in summer before dispersing by the autumn.



A Bat Brick should ideally be placed as high as possible, at the gable apex or close to the soffit.

APPENDIX D4: Suggested Planting List

Oak	*Quercus robur & Q. petrea*
Ash	*Fraxinus excelsior*
Silver Birch	*Betula pendula*
Field Maple	*Acer campestre*
Hawthorn	*Crataegus monogyna*
Alder	*Alnus glutinosa*
Goat Willow	*Salix caprea*
Grey Willow	*Salix cinerea*
weeping willow	*Salix babylonica*
purple willow	*Salix purpurea*
white poplar	*Populus alba*
Guelder Rose	*Viburnum opulus*
Hazel	*Coryllus avellana*
Blackthorn	*Prunus spinosa*
Elder	*Sambucus nigra*
Buddleja	*Buddleja davidii*
holly	*Ilex aquifolium*
yew	*Taxus baccata*
ling heather	*Calluna vulgaris*
bell heather	*Erica cinerea*
bilberry	*Vaccimium myrtillus*
Night-scented catchfly	*S.noctiflora*
Bladder campion	*S. vulgaris*
Night-scented stock	*Matthiola bicornis*
Sweet rocket	*Hesperis matronalis*
Evening primrose	*Oenothera biennis*
Tobacco plant	*Nicotiana affinis*
Cherry pie	*Heliotopum x hybridum*
Soapwort	*Spanoka officinalis*
Chives	*Allium schoenoprasum*
Sage	*Salvia officinalis*
Marjoram	*Origanum vulgare*
Borage	*Borago officinalus*
Mint	*Mentha* sp.
Honeysuckle (native)	*L. periclymenum*
White jasmine	*Jasminium officinale*
Dogrose	*Rosa canina*
Fieldrose	*R. arvensis*
Ivy	*Hedera helix*

Appendix E: Traffic Figures

Appendix F: Traffic – Further Information

Appendix F1: Traffic Extract of Submission to Limerick City Council

Appendix G: Traffic – Clarification of Further Information

Appendix G1: Traffic Extract of Submission to Limerick City Council