MONTGOMERY E.H.S.

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BALLYFASKIN, BALLYLANDERS, COUNTY LIMERICK

ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED EXPANSION OF A PIGGERY OPERATION

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1 LEGISLATIVE REQUIREMENTS

1.1 INTRODUCTION

This chapter broadly describes the legislation under which Patrick Ryan proposes to expand the existing piggery operation. The planned development will require submission of a Planning Application to Limerick County Council, together with an Environmental Impact Statement.

1.2 ENVIRONMENTAL IMPACT ASSESSMENT AND PLANNING LEGISLATION

This Environmental Impact Statement (EIS) has been prepared in accordance with the requirements of the European Communities (Environmental Impact Assessment) Regulations, 1989 to 2001 and the Planning and Development Act, 2000 and Planning and Development Regulations 2001. This legislation requires the assessment of the effects of certain public and private projects on the environment.

The developer following discussion with the planning authority is required to have an EIS carried out as part of the planning application under the following regulations:

1) EC (Environmental Impact Assessment) Regulations 1989. Article 24. Schedule. Part II 1. (d) Pig-rearing installations, where the capacity would exceed 1,000 units on gley soils or 3,000 units on other soils and where units have the following equivalents; 1 pig = 1 unit, 1 sow = 10 units
2) Planning and Development Regulations 2001 (S.I. No. 600 of2001).
    - These regulations state that even if the development is under the relevant EIA threshold the planning authority is required under article 103 to request an EIS where it considers that the proposed development is likely to have significant environmental effects.
    - Section 17: An EIS is required for " pig-rearing installations, with more than 2,000 places for production pigs (over 30 Kgs.) in a finishing unit, more than 00 places for sows in a breeding unit or more than 200 places for sows in an integrated unit;).

The documents *Guidelines on the information to be contained in Environmental Impact Statements*, 2002 and *Advice Notes on Current Practice (in the Preparation of Environmental Impact Statements)*, 2003 as prepared by the EPA, were followed in the preparation of this EIS. The guidelines state that in preparing an EIS, the Developer will carry out an analysis of the likely effects of the project (positive or negative) on the environment. The Environmental Impact Assessment procedure commences at the project design stage when the scope of the study is determined. Studies are then carried out to investigate, in detail, any potential environmental impacts. Where significant adverse impacts are identified, measures are recommended to mitigate or avoid the impact of the proposed Development.

This Environmental Impact Statement examines the potential significant impacts of the proposed expansion of the piggery operation at the Ballyfaskin, Ballylanders, Co. Limerick. The extent of the proposed scheme is described in detail in **Chapter 2**. The potential environmental impacts of the proposed scheme are addressed in **Chapters 3-14** of this volume of the report under the headings, Human Environment, Natural Environment, Material Assets and Architecture, Archaeology and Cultural Heritage.

1.3 SCOPE OF THE ENVIRONMENTAL IMPACT STATEMENT

Scoping is an essential part of the preparation of any planning application as it ensures that all potential and important significant impacts on the receiving environment are taken into account at the earliest possible time. Scoping by its very nature will evolve with the project as design changes are made and more detailed information on environmental issues and design comes to hand. However, as an early stage tool it provides relevant information on the most important potential impacts of the project, which will have to be addressed in the Environmental Impact Statement. With regard to EPA criteria for scoping, the environmental areas that may be impacted by the proposed scheme were identified and are:

Human Beings

During scoping, particular regard was given to the potential impact of the expansion to the piggery operation on the local communities.

Natural Environment

The site of the existing piggery operation and the proposed extension is located in an area of poor ecological value. The site is not located or boarding any sensitive ecological areas including Natural Heritage Areas (NHA) Special Area of Conservation (SAC) or Special Protection Area (SPA).

The impacts on the ecology contained within must be assessed with care to ensure that all impacts are clearly identified and where possible removed, reduced or minimised to a satisfactory level.

Material Assets

This involves aspects impacted by land take for the proposed scheme and available resources such as soils, utilities etc. The development will be constructed primarily on 'greenfield' site in land currently owned by Patrick Ryan.

Architecture, Archaeology and Cultural Heritage

The site is located in an area of improved agricultural grassland, and is of low potential with regard to archaeological and other cultural heritage finds.

1.3.1 Scenarios Investigated

A number of different scenarios have been examined when determining likely significant impacts.

- The "do nothing" scenario which compares the quality of the existing receiving environment with that of the likely environment should the proposed scheme not be built.
- the "do something" scenario which compares the quality of the existing receiving environment with that of the likely environment should the proposed scheme be built.

1.4 IDENTIFICATION OF LIKELY SIGNIFICANT IMPACTS

Schedule 6 of the Planning and Development Regulations requires that projects requiring an EIS describe likely, direct and indirect significant impacts of a proposed scheme. The Environmental Impact Statement will follow the same basis. The EPA (Guidelines on the Information to be Contained in Environmental Impact Statements, 2002) defines an impact as "the degree of change in an environment resulting from a development" and continues to elaborate on impacts in terms of quality (positive, neutral or negative), significance (imperceptible, slight, moderate, significant or profound), duration (temporary, permanent, short-term, medium-term or long-term) and type (cumulative, indeterminable, irreversible, residual, synergistic or 'worst case').

The following factors have been considered for this Environmental Impact Statement when determining the significance of the impacts, both positive and negative, of the proposed scheme on the various aspects of the receiving environment:

- The quality and sensitivity of the existing/baseline receiving environment.
- The relative importance of the environment in terms of national, regional, or local importance.
- The degree to which the quality of the environment is enhanced or impaired.
- The scale of change in terms of land area, number of people impacted, number and population of species affected including the scale of change resulting from all types of impacts.
- The consequence of that impact/change occurring.
- The certainty/risk of the impact/change occurring.
- Whether the impact is temporary or permanent.
- The degree of mitigation that can be achieved.

The magnitude of the impacts outlined in the chapters which follow take into account the guidelines given by the EPA and those scales used in other EIS documents for significant developments in this country. A broad outline of the scale of impacts is given in **Table 1.1**.

Where mitigation in the form of design measures have been suggested throughout the evolution of the Environmental Impact Statement, these have been incorporated into the scheme design as far as is possible from an engineering perspective.

Table 1.1: General Criteria used to Quantify the Potential Impacts of the Proposed Scheme

Degree of Impact/Significance Level		Definition of Impacts
Profound	Significant Impact	An impact, which obliterates sensitive characteristics.
Major		An impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Moderate		An impact that alters the character of the environment in a manner that is consistent with existing and emerging trends.
Slight		An impact, which causes noticeable changes in the character of the environment without affecting its sensitivities.
Not significant	Neutral or Imperceptible Impact	An impact which does not change the quality of the environment, is capable of being measured but without noticeable consequences and causes changes in the character of the environment which are not significant or profound.

2 SITE LAYOUT AND CONSTRUCTION

This Environmental Impact Statement (E.I.S.) has been prepared by Mr. Trevor Montgomery, of Montgomery EHS with the assistance of persons and bodies referred to hereafter. This E.I.S. has been prepared after an Environmental Impact Assessment (E.I.A.) of the proposed development in accordance with the Planning and Development Acts 2000 - 2006, Planning & Development Regulations 2001-2006 and the Protection of Environment Act 2003.

This E.I.S. forms part of a planning application to Limerick County Council on behalf of Mr. Patrick Ryan, Ballyfauskeen Enterprises Ltd, Ballyfaskin, Ballylanders, Co. Limerick for permission to demolish two No. existing pig houses and remove 3 No. pre-fabricated weaner houses, and to construct a new loose welfare friendly dry sow house, 3 no. fattening houses, a new farrowing house, a feed mill, new site entrance including access road and associated site works. the development proposes to replace two existing farrowing houses, an existing fattening house and a gilt house at ballyfaskin, ballylanders, co limerick (National Grid Reference: R 78891 23469).

This E.I.S. will also form part of a submission to the EPA for an Integrated Pollution Prevention and Control (I.P.P.C.) Licence on behalf of the applicant Mr. Patrick Ryan.

This existing farm, and site of the proposed development i.e. the subject site, is located on c. 2.6 Ha, in the townlands of Ballyfaskin which is approxametely 3.0 km north east of Ballylanders.

2.1 DESCRIPTION OF DEVELOPMENT.

The application relates to a proposed integrated 600 sow pig production unit finishing c. 17,500 pigs per annum, at 105 to 110 kg. live weight. As a result of the breeding programme and the high health status of the pigs on this farm, some of the gilts bred and reared on this farm may be sold to other pig farms as replacement breeding stock. It is the intention of the applicant to operate the farm with the uppermost regard for environmental protection while at the same time implementing modern management methods on the farm.

This farm currently operates with a maximum capacity for a 300 Sow unit. At present Mr. Ryan finishes 100% of the pigs on this farm. Planning Permission was granted to Mr. Ryan for development on this farm by Limerick Co. Co. in 2009, for the extension of farrowing house D and replace existing farrowing house E and associated site works.

It is the intention of the applicant to continue to operate the farm with the uppermost regard for environmental protection while at the same time implementing modern welfare and environmentally friendly management processes on the farm. Modernisation/consolidation is an essential part of viable sustainable pig production. The structures for which permission is being sought incorporate modern design concepts in the areas of animal welfare, insulation, ventilation and environmental protection in the operation of the farm.

Improvement in production efficiencies in the breeding herd and performance in the grower/finisher pigs are dependant on provision of adequate top quality housing and welfare in tandem with modern feeding and ventilation systems and top quality genetics.

Mr. Ryan proposes to construct the following:

- 3 No. Fattening houses. - (Floor area c. 3* 1531.8 m2) located on the site of, and replacement of 1 Fattening House (Floor area c. 1070.4 m2)
- 1 Feed Mill (Floor area c. 400 m2)
- Farrowing House (Floor area 653.3 m2)
- 1 Dry Sow House (Floor area 1192.4 m2)
- 1 Construction of a Farrowing Houses (floor area 653.312 m2) and replacement of existing farrowing house (Floor area 413.8 m2)

- 1 replacement of Gilt House (Floor area 258.5 m2)
- 1 new access road and, any associated site works and ancillary structures arising from the proposed developments as outlined above.

Permission for this proposed development is being sought to,

- To allow this farm operate as a fully independent, integrated pig unit
- Provide adequate space for all piggery to ensure maximum performance and efficiency, and to achieve target sale weights.
- Improve the management washing routines within the unit, thus reducing washing time and water usage.
- To ensure the efficient use of all inputs such as labour, machinery etc., and to avoid the inefficiencies with regard to the transport of pigs between farms and the associated division of machinery and labour.

The total area of the site existing site is 1.2 Ha and the proposed development incorporating existing and proposed areas is 2.6 Hectares. The proposed will be situated adjacent to the existing piggery operation and approximately 25m from the road along the site's boundary.

Patrick Ryan's site at Ballylanders, Co. Limerick is located within the town land of Ballyfaskin, northeast of Ballylanders town centre and north of the R513 as shown on Figure 1.

The proposed development will be constructed on the existing site at grid reference R 78891 23469 (O. S. Map no.73). The site is located in a rural farmland area, approximately 3km northeast of the town of Ballylanders.

The piggery complex is situated alongside a regional road (R 662) which runs along the north of the site in an north northly direction and which connects to the R512 to the south. To the north of the site is Ballyfaskin Cross Roads which intersects a local road and the R662.

The nearest dwelling house is the developer's, at a distance of approximately 30m north of the site. The next dwelling house is approximately 40m from the site. The area is extremely rural and not highly populated. The site of the proposed development is currently used for silage cutting and existing piggery buildings.

The site boundary is marked by a combination of hedgerowes and fencing. The complex is situated on a flat ground and it is largely shielded from view from all directions due to the trees characteristic of the topography.

However every effort will be made by the developer to further obscure the complex from the surrounding locale, if necessary, by a combination of a further hedgerow, native trees, fencing or soil embankement.

The proposed development will not severely impact the landscape of the area and will blend with the existing agricultural units on the site.

The proposed development would have a capacity to increase the number of sows from 300 to 600. The maximum height of the proposed buildings would come from the Mill which would be approximately 18.3 meters to apex.

The site boundary is marked by hedgerows with fencing in some parts. The existing entrance is located at the northern boundary and has been considered unsuitable for the proposed and existing piggery operation, as indicated in the Site Layout Plan (Figure 5 and T001).

Drainage:
Uncontaminated yard and roof runoff are diverted via the surface water gullies to a drain and piped into the site drainage ditch and the same will apply to the new and modified buildings.

Foundation:
The proposed and modified buildings will be in part constructed on top of underground slurry storage tanks but the Mill building will be constructed on an impermeable concrete foundation, to be laid by the developer or a hired subcontractor.

Buildings:
The Buildings will be installed by an approved contractor. The buildings will be insulated.

Roofing:
The roofing will be an insulated timber construction, with an aluminium surface.

Underground Slurry Tanks:
The proposed slurry storage tanks of varying capacity will be situated underground and below the buildings with the exception of the Mill. The tanks construction will conform to the Department of Agriculture, Food and Forestry's Specification No. 123 "Minimum Specification Slatted Livestock Units: Reinforced Concrete Tanks" DAFF, 1994.

Feed Silo:
On completion of construction works, feed silos (approx. 7.6m high, 3.0m diameter) will be installed and will be placed in the Mill and adjacent to some of the piggery building.

See Figures 5 and 6 and C001 to C007 for a description of the location of proposed development.

Construction works are expected to occur over a duration of approximately five months. The extra traffic and noise generated will be only temporary. Complaints are not expected from those living in and travelling through the area.

3 ALTERNATIVES

3.1 EXAMINATION OF POSSIBLE ALTERNATIVES

Schedule 6, Article 94 of the Planning and Development Regulations 2001 requires that:

Information to be contained in an Environmental Impact Statement shall include –

(1d) an outline of the main alternatives studied by the developer and an indication of the main reasons for his or her choice, taking into account the effects on the environment.

3.2 Alternative Sites

A review of Patrick Ryan's owned property reveals that this is the only feasible available site for the construction of a number of piggery buildings and access roads.

Acquiring property further away from the existing piggery operation has been ruled out as:

- Land would be expensive to acquire
- Construction costs would be more expensive as the proposed expansion of the piggery operation would be connected into the existing infrastructure, thus avoiding duplicate costs of constructing a new feeding, water and heating systems, electrical infrastructure and access.
- Operation costs would be more expensive as addition feed silos and pumping distances would be greater and electricity infrastructure would have to come from existing National Grid as opposed to existing on site electrical infrastructure.

3.3 Alternative Layouts

The layout of the site was considered for the proposed development to minimise the operational cost of the development and consider animal welfare. However, the footprint of the proposed development is subject to a number of physical constraints. The site of the extension is restricted to land already in the ownership of Patrick Ryan.

The proposed location is considered the best viable option due to the avoidance of disturbance of the pigs during delivery and collection. The proposed location will aid the screening of the proposed buildings with the existing hedgerows retained where possible.

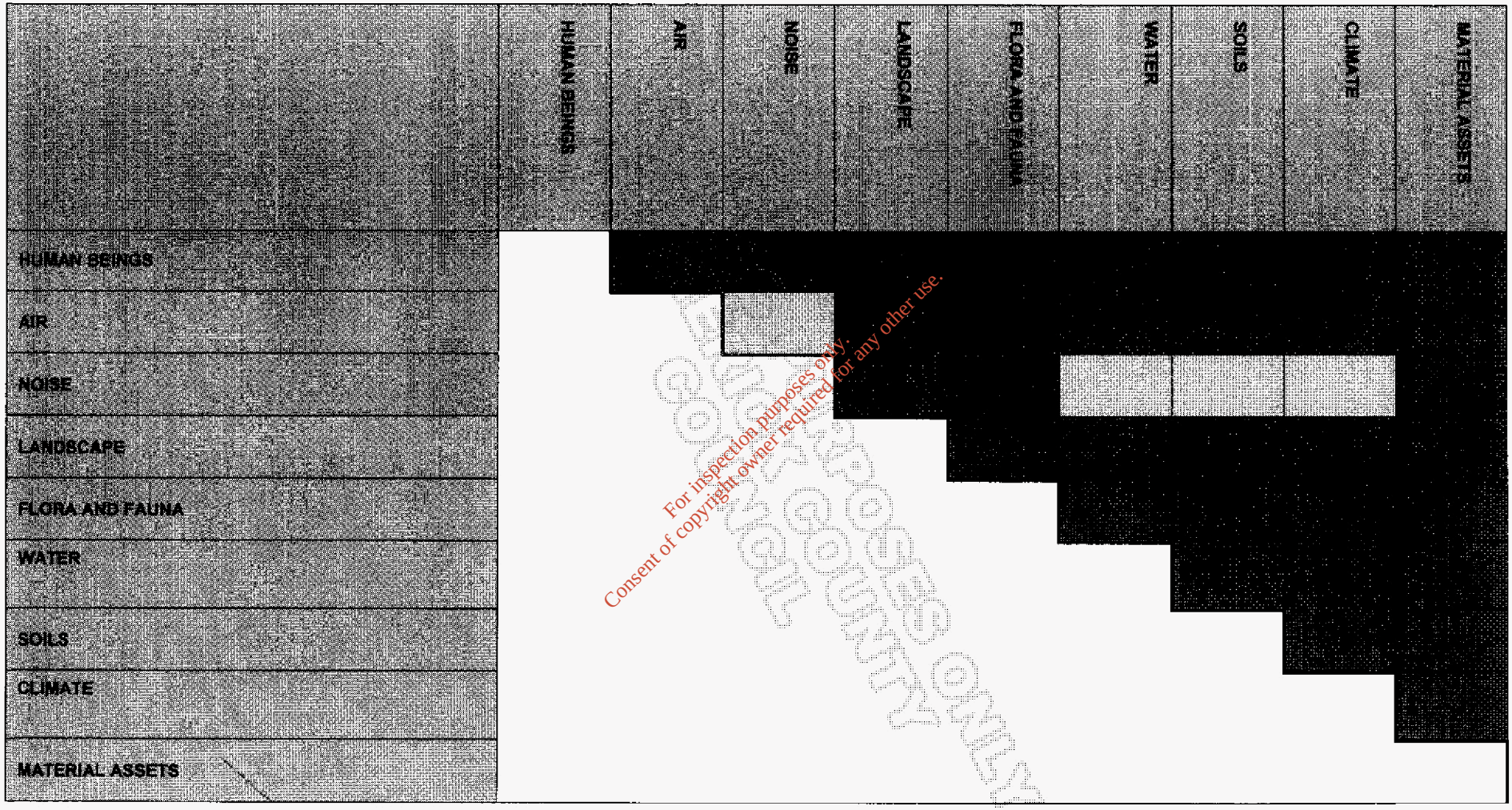
4 INTERACTIONS AND INTER-RELATIONSHIPS

In line with requirements of EC Directive 85/337/EC (as amended) and the Planning and Development Regulations 2001, the interactions/inter-relationship between the various environmental factors was also taken into account as part of the Environmental Impact Statement scoping and assessment. Where a potential exists for interaction between two or more environmental topics, the relevant specialists have taken the potential interactions into account when making their assessment and where possible complementary mitigation measures have been proposed.

Table 4.1 shows a matrix of significant interactions likely to occur from the proposed development. The boxes marked with a dot in **Table 4.1** indicate that a potential relationship exists between the two environmental factors. The level of interaction between the various topics will greatly vary but the table allows the interactions to be recognised and further developed where necessary. The table is constructed on the basis that an environmental subject has a potential inter-relationship both during the construction and operational phases of the proposed scheme. Summary details on the interactions are provided in **Table 4.2.**

To fully explain what is meant by an inter-relationship or interaction between environmental topics an example is provided. Noise can interact with a number of environmental aspects. Noise issues primarily feature under the heading of Human Environment and most of the standards and guidelines on noise relate exclusively to human beings. However, noise can impact on terrestrial fauna such as birds and material assets in the form of commercial livestock and so it must be taken into account as part of the agricultural and ecological assessment also.

Table 4.1: Interaction/Inter-Relationship Matrix - Potential Significant Interaction in the Receiving Environment



The following are the interactions anticipated from the proposed scheme.

Table 4.2.: Summary of Potential Interactions / Inter-relationships

Subject	Interaction with	Interactions / Inter-relationships
Air	Human Beings	In terms of the proposed development, dust (both during the construction phase) and its impact on the communities and residents adjacent to the piggery buildings will be the main issue. During the operational phase odour will be the main air quality issue.
	Flora and Fauna	Vegetation can act as a purifier for air in absorbing CO_2 and giving out oxygen. Dust coating vegetation would affect normal respiration during construction.
	Water	No Interactions / Inter-relationships
	Soils	Dust from exposed soils during construction could cause deterioration of air quality in the immediate vicinity of the development.
	Climate	Local heating of air in the buildings could cause microclimate change in those areas.
	Material Assets	No Interactions / Inter-relationships
Noise	Human Beings	Sensitive receptors located close to the proposed extension may experience some increase in noise particularly during the construction stage.
	Flora and Fauna	Construction proposals could result in significant noise disturbance which may impact on the fauna and avifauna currently using the area.
	Material Assets	No Interactions / Inter-relationships
Landscape	Human Beings	The proposed development will have a minor appearance in the landscape of the area.
	Flora & Fauna	A small loss of hedgerow will occur as important wildlife corridors for animals. Improvement of the remaining hedgerow will be conducted post development.
	Water	No Interactions / Inter-relationships
	Soils	Movement of significant quantities of soil from one area to another can affect the appearance of the landscape. This will be necessary as part of the construction when material is removed from the construction zone.
	Material Assets	No Interactions / Inter-relationships
Flora and Fauna	Human Beings	There will be minor impact on the fauna and flora of the area as they suffer habitat loss and dislocation due to the proposed scheme.
	Water	During construction there is a minor risk of disturbance to drainage channels. This will require special precautions to avoid disturbance of sediments with consequent effects on fauna.
	Soils	Stabilisation methods for soft soil areas could alter the pH balance with consequent change in flora cover and species of fauna supported.
	Climate	No Interactions / Inter-relationships
	Material Assets	Land take will result in a loss of habitat and local loss of range for terrestrial fauna.

Water	Human Beings	No Interactions / Inter-relationships
	Soils	Surface water runoff waters could cause deterioration of water quality of streams.
	Material Assets	No Interactions / Inter-relationships
Soils	Human Beings	Dust from exposed soils during the construction period can cause dust nuisance if not properly mitigated.
	Material Assets	Extraction, movement and placing of soils will have an energy input requirement.
Climate	Human Beings	No Interactions / Inter-relationships
	Material Assets	No Interactions / Inter-relationships
Material Assets	Human Beings	Current land-use will be permanently altered including the loss of ecological habitat and farmland.

SECTION A – HUMAN ENVIRONMENT

This section of the Environmental Impact Statement deals with the potential effects of the proposed scheme on human beings.

These effects have been grouped into:

- Community Impact- the direct or indirect impact of the scheme on the population living or working in the general vicinity of the proposed piggery expansion at Ballyfaskin, Ballylanders, Co. Limerick.
- Air Quality Impacts – the impact of emissions generated by the proposed piggery expansion at Ballyfaskin, Ballylanders, Co. Limerick.
- Noise and Vibration Impacts - the impact of noise and vibration generated by the scheme on noise and vibration levels in the general vicinity.
- Landscape and Visual Impacts – the impact of the scheme on the aesthetic aspect of the landscape.

While human beings interact in some way with every aspect of the environment, the above interactions are considered the most significant in this case. The impacts on human beings in relation to effects on the natural environment are considered in **Section B** while the impacts of effects on material assets and architecture, archaeology and cultural heritage are considered in **Sections C and D** respectively.

5 AIR QUALITY AND CLIMATE

5.1 INTRODUCTION

The air quality study identifies, describes and assesses the impact of the proposed extension to the piggery growing operation on air quality and climate. Particular attention has been given to sensitive receptors, such as residential areas adjacent to the site and to the extent of the exposure of these receptors to airborne pollutants derived as a result of the development. This assessment was prepared in accordance with the EPA document - Guidelines on the Information to be contained in an Environmental Impact Statement (2002).

5.2 METHODOLOGY

5.2.1 Baseline Monitoring

5.2.1.1 Total Suspended Particles (Dust)

Dust generation, dispersion and deposition from operation and construction activities are typically considered an environmental nuisance for sensitive receptors in the vicinity of a development. The potential sources of dust in the proposed development during the construction and operation phases are from trafficking and strong winds in dry conditions, (leading to suspension of dried soil particles from the proposed extension to the piggery operation). Earthworks during the extension construction are also a potential source of dust pollution.

As there are no set limits for dust deposition in Ireland, the TA Luft guidelines are referenced. TA Luft is the German Government technical instructions on air quality and referenced by the Irish EPA. Dust deposition monitoring using Bergerhoff-Gauges would be the recommended standard method meeting TA-Luft (1986) requirements. No monitoring was conducted at Patrick Ryan's piggery operation as it would be considered that there is a minor risk of deposited dust level exceeding the TA Luft levels.

5.2.1.2 Odours

An Odour Management plan is for Patrick Ryan piggery operation and is presented and accompanies the EIS. Mr Ryan operation in summary Mr Ryan is committed to operating the existing facility to best practice. The proposed redevelopment of the piggery will have the best available water and feeding systems and following construction of this industry. Mr Ryan plans to modernise the existing buildings with the same water and feeding systems in the next 5 years or so. The key factors for odour management from a piggery operation are:

- Avoiding the build-up of slurry or manure on concrete around buildings;
- Removal and disposal of dead animals;
- Drain maintenance;
- Bedding cleanliness;
- Management of drinking systems, with particular emphasis on frequently checking to avoid spillage;
- Stocking density;
- Insulation of the buildings and the long term maintenance of that insulation;
- Ventilation and heating system;
- Type of heating;
- Composition of the feed, particularly its oil and fat content and its protein content.

Mr Ryan has never received any complaint directly in relation to his piggery from a local resident, Local Authority, EPA, HSE, etc. In previous planning application there has never been complaints to the planning authority in relation to odours.

As part of the Odour management plan Mr Ryan is committed to doing whatever is necessary to avoid complaints and if necessary is committed to the installation of odour abatement technology such as bio-scrubber or bio-filters. Mr Ryan's piggery operation has a good record with Bord Bia audits and other audits such as Entegra (UK) audit.

Although odour generated in the operation may be more detectable at certain times, as partly influenced by prevailing weather conditions, the townland and surrounding townlands are well accustomed to occasional odour from this type of operation. This in mind however, odour levels generated are not expected to cause a significant nuisance in the surrounding area, as the operation will be management to the best possible level. Attached as part of the planning application is an odour management plan covering all aspects of the current and proposed expanded operation.

5.3 DESCRIPTION OF BASELINE AIR QUALITY

5.3.1 Site Location

The location of the proposed development at Patrick Ryan's piggery operations is at Ballyfaskin, Ballylanders, Co. Limerick. The site is located 3 km to the south east of Ballylanders, Co Limerick, approximately 25km southeast of Limerick City. The village of Kilfinnane is located to the south, approximately 3 km north from the proposed development. The townland of Ballyfaskin is situated south of Knockaunnacurraha, to the north the townland of Ballyduff. The site is west of Inchacoomb and to the east is Curraghturk, as shown in Figure 1, 2 & 3.

5.3.2 Existing Sources of Air Emissions

This facility with its existing piggery has an existing impact to air quality as a result of emissions from combustion of fuel to heat the buildings. The town of Ballylanders is located approximately 3 km north east of the proposed site for Patrick Ryan's piggery operation. The main source of air pollution would arise from domestic and commercial fuel combustion. Emissions from oil combustion include mainly carbon monoxide, nitrogen oxides, sulphur dioxide and particulates as well as greenhouse gases. .

5.4 IMPACTS

5.4.1 Dust

Dust levels generated by the development, both in the construction and operational phase, would be negligible. Minimal levels of dust will be generated, during the construction phase. Such dust will only be evident on the site and will not impact on dwellings and other buildings in the vicinity of the site, which are situated far enough from the operation so as not to be effected by any dust generated. Regular washing of the yard areas and periodic rainfall will also mitigate any dispersal of dust generated by site traffic. During the operational phase thorough cleaning of the buildings between batches will ensure that the emission of dust will not be an issue An adequate ventilation system employed in the buildings will ensure no nuisance of dust within the buildings. Any dust dispersed around the yard areas as a result of the ventilation systems in the buildings will be cleaned up regularly and will not cause any problems off site.

5.4.2 Odour

Routinely the various buildings are cleaned out between batches approximately every 16 to 24 weeks, and the cleared out. Wash water generated from the cleaning of the buildings will be stored in the underground tanks for each building. The underground tanks will be covered with propose or existing buildings and certified by a qualified engineer.

5.5 MITIGATION MEASURES

5.5.1 Dust

During the operational and construction phase of the piggery facility all efforts will be made to ensure no dusting occurs. Top soil will be removed off-site and stored appropriately if there is an excess following construction.

5.5.2 Odour

The Odour Management plan is Mr Ryan statement of intent on how odours will be managed from the proposed and existing site.
The following measures will ensure little or no impact from odour on the surrounding environment:
Good practice in terms of:

- Piggery buildings temperature control
- Carcass storage and removal from site
- Thorough cleaning out of the buildings between batches
- Regular yard cleaning
- Strict adherence to good land spreading practice

No complaints of odour or dust have been received in relation to the existing piggery operation; therefore the commissioning of an expanded piggery capacity is not expected to cause a nuisance in the surrounding locality.

In the event that an odour nuisance is occurring from the pig slurry, the mitigation measure will be the use of a masking agent, which is a chemical component in an open-air spray specifically designed to mix with the fugitive odour. These masking agents typically have pleasant odours designed to "mask" the unpleasant odour.

5.6 CONSTRUCTION IMPACTS AND MITIGATION

It is proposed to use local source rock and concrete for the supply of rockfill and processed aggregate. The facility roads are constructed of rock fill and topped with fine aggregates.

5.6.1 Impacts

Construction activities e.g. excavation, earth moving etc. may generate quantities of construction dust, particularly in drier weather conditions. The extent of any construction dust generation depends on the nature of the construction dust (soils, sands, gravels, silts etc.) and the construction activity. The potential for construction dust dispersion depends on the local meteorological factors such as rainfall, wind speed and wind direction.

The issue of construction dust dispersion may be exaggerated with vehicles transporting sands/gravels/soils etc. to and from the site having the potential to cause an environmental nuisance.

The effect of construction activities on air quality, in particular construction dust, will not be significant following the implementation of the proposed mitigation measures outlined below. The main environmental nuisance associated with construction activities is dust.

5.6.2 Mitigation

It is proposed to adhere to good working practices and dust mitigation measures to ensure that the levels of dust generated will be minimal and are unlikely to cause an environmental nuisance.

- Hard surface roads shall be swept to remove mud and aggregate materials from their surface.
- Any un-surfaced roads shall be restricted to essential site traffic only.
- All vehicles exiting the site shall make use of a wheel washing facility, prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads. This water will be collected into one of the existing wash water tanks
- 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.
- Diesel engines of plant machinery and trucks shall be properly maintained so that they do not discharge excessive quantities of visible smoke likely to result in a local nuisance.

5.7 MONITORING

There is no proposed monitoring for dust at the piggery operation. If any complaints are received a follow-up investigation will be initiated, as soon as feasible and all results made available to the Local Authority and EPA for Inspection.

Routine odour surveys will be completed by an appointed person following the EPA Air Guidance on Odour Assessment (AG5) will be initiated and these reports will be retained on-site.

In the event that dust or odour from the proposed development is creating an environmental nuisance. An ambient dust deposition survey will be carried out by an air quality specialist and mitigation measures will be developed to eliminate the nuisance. In the event of Odour nuisance an investigation following the EPA Air Guidance on Odour Assessment (AG5) will be initiated

6 NOISE

6.1 INTRODUCTION

Any sound, which can cause nuisance or a deterioration of amenities or quality of life, is examined in this chapter. Noise is a feature of most structural developments particularly during the construction phase. This will be the case during the construction of the proposed expansion of the piggery operation. Noise on a daily basis will result from regular operation of checking the stock, water and feed systems and deliveries.

An appraisal of the potential impacts from noise generated by the proposed expansion to the piggery operation on the surrounding environment was carried out by Montgomery EHS. The study identifies, describes and assesses the impact of the proposed extension in terms of noise. The assessment focuses particularly on noise impacts on residential locations (sensitive receptors) in the vicinity of the proposed development.

6.2 METHODOLOGY

Baseline noise information for this study was collected through a noise survey conducted in accordance with ISO 1996 '*Acoustics: Description and Measurement of Environmental Noise*'. Noise levels during the operational phase of the development were predicted using ISO 9613 '*Acoustics: Attenuation of Sound during Propagation Outdoors*'. Operating noise limits have been set using the Integrated Pollution Prevention & Control Licence conditions.

The noise survey results are presented in terms of the following three parameters:

- LAeq 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.
- LA10 is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.
- LA90 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.

6.2.1 Baseline Noise Survey

A baseline noise survey was conducted as part of this noise assessment at locations adjacent to the proposed extension and its nearest noise sensitive locations. The survey was carried out on the 8th March 2012 and measurements were made over intervals of 30 minutes during the day and 30 minute night time monitoring. Noise measurements were made at the locations described in **Table 6.1**. These locations are also shown in **Figure 13.**

Table 6.1: Description of Noise Monitoring Locations during Baseline Survey

Map Reference	Description
1	Existing entrance
2	Entrance to Patrick Ryan parents' house
3	Ballyfaskin Cross Roads
4	Local Access road to Patrick Ryan House

6.2.2 Noise Criteria

Typical conditions for sites, licensed by the Environmental Protection Agency (EPA) in order to control noise from the site are outlined below. These conditions stipulate operating noise levels that should not be exceeded at any noise sensitive location surrounding the site. The following sound pressure limits are set down by the EPA.

Daytime	55dB $L_{Aeq\ 15mins}$
Night time	45dB $L_{Aeq\ 15\ Mins}$

Daytime is normally defined as 08:00 to 22:00 hours and night time is usually defined as 22:00 to 08:00 hours. The noise criteria outlined above are also in line with the World Health Organisation (WHO) guidelines for community noise. These guidelines recommend a noise level of 55dB L_{Aeq} within outdoor living areas in order to avoid serious annoyance during daytime and evening and a level of 45dB L_{Aeq} outside bedrooms during night time periods in order to avoid sleep disturbance.

These noise level limits will also be used as the target criterion for the operation of the expanded piggery operation.

6.3 DESCRIPTION OF EXISTING ENVIRONMENT

6.3.1 Existing Noise Levels

The noise climate in the vicinity of the existing site is relatively low. The operation of the existing piggery operation involves site transport traffic (cars, delivery and collection trucks), feed and water system, etc., which at present do not contribute to any significant noise levels at the nearest noise sensitive locations surrounding the site.

Noise levels measured at the nearest noise sensitive locations to the site, located within along the road leading to the site. The movement of vehicles along the road were the main noise contributors within this area.

6.3.1.1 Baseline Survey Results

The baseline survey carried out as part of this Environmental Impact Statement has indicated that noise levels are within the EPA typically IPPC Licence guidance levels of 55dB L_{Aeq} for noise during the daytime and 45dB L_{Aeq} during the night time period at noise sensitive properties. The results of the baseline noise survey are summarised in **Table 6.2**.

Table 6.2: Existing Day time Noise Levels Measured During Baseline Survey

Location	Time	L_{A90}	L_{Aeq}	L_{Amin}	Survey Description	Notes
1	09:27	51	65	45	Measurement taken at road	Cars passing on main road and site noise
2	10.08	52	63	46	Measurement taken at road	Cars on road main noise source
3	10.52	47	59	44	Measurement taken at road	No major noise sources
4	11.34	47	58	43	Measurement taken at road	Vehicles audible from road

Table 6.3: Existing Night Time Noise Levels Measured During Baseline Survey

Location	Time	L_{A90}	L_{Aeq}	L_{Amin}	Survey Description	Notes
1	23:31	42	54	39	Measurement taken at road	Cars moving but not on road
2	00.08	41	53	38	Measurement taken at access road	No Major Noise sources
3	00.52	44	50	39	Measurement taken at road	Vehicles audible from distance
4	01.37	40	52	36	Measurement taken at road	Vehicles audible from distance

6.4 IMPACTS

During the operational phase of the proposed expansion of the piggery operation, there is a potential for increased site traffic and operational equipment including additional feed and water systems. As the footprint of the development expands, these noise sources have the potential to increase noise levels at these nearby properties. The fact that the proposed extension moves away from the nearest residences the risk of noise complaints is low.

7.3.3.2 Limerick County Development Plan 2010 - 2016

The Limerick County Development Plan, 2010 - 2016 as amended, contains the following relevant landscape and visual references.

Chapter 7 Environment and Heritage at **Section 7.2 Landscape and Visual Amenity** amongst other aspects considers issues relating to Trees, Tree Preservation Orders and Hedgerows and Landscape and Visual Amenity.

Under Sub-section 7.2.1 on Trees, Tree Preservation Orders and Hedgerows, the Plan sets out policies relating to enhancing tree cover within the county as follows:

Policy ENV 5: Enhancing Tree Cover	It is the policy of the Council to preserve and enhance the general level of tree cover within the county, both in the countryside at large and also in the county's towns. The Council strongly encourages the establishment of native species, in particular broadleaf species.
Policy ENV 6: Landscaping & Development	It is the Policy of the Council to ensure the adequate integration of development into the landscape by the retention of trees and landscape features and/or encouraging suitable planting.

Under Sub-section 7.2.2 on Landscape and Visual Amenity, which the sets out policies relating to Landscape Character, Views and Prospects, Landscape and Amenity Views. Under its Landscape Classification Limerick County Council has identified ten Landscape Character Zones within the county. The site and surrounding area does not fall under a landscape character zone as set out by the County Development Plan.

7.3.4 "Do-Nothing" Scenario

Should the proposed development not proceed the existing piggery operation will remain and continue to be developed under the conditions of the existing planning permission.

7.3.5 "Do-Nothing" Scenario

Should the proposed development proceed the existing piggery operation will be expanded to 600 sows capacity and will remain and continue to be developed under the conditions of the new planning permission.

7.4 CHARACTERISTICS OF THE PROPOSAL

7.4.1 Introduction

The construction of an additional new and modified piggery buildings with a capacity of 600 sows proposes to carry out a series of modifications to the site as set out in detail in **Chapter 2 Site layout and Construction** of the Environmental Impact Statement. In effect the principal landscape and visual aspect of the proposed development entails an expansion of the piggery operation.

The following assessment focuses on the proposed extension to the piggery operations

7.5 IMPACTS

7.5.1 Impact Assessment

This involved examining the location of domestic dwellings and the location of the existing and proposed piggery buildings.

In assessing the impact the construction and operational phases and are considered.

7.5.2 Construction Phase of the Piggery Buildings

The construction phase will have a relatively low landscape and visual impact. Aspects which pertain to the construction phase proper include:

- General site works,
- Vegetation removal,
- Excavations and stockpile of topsoil and subsoil, and
- Removal of buildings for upgrade
- The construction of the new buildings and feed mill.

By its very nature all this activity will take place at a relatively low level and against the backdrop of the existing piggery buildings with its various on-going activities. The final phase of the construction phase will be the erection of the new buildings.

7.5.3 Operational Phase

The nature and process by which the piggery buildings will develop is an established and on-going feature of the existing environment. Furthermore given the relatively low lying nature of the landscape, It is considered that, the proposed development will *not have major significant 'landscape' impact.*

The completed additional piggery buildings will represent a minor feature in an otherwise low lying setting of the area. The additional and modified buildings is behind the existing buildings and further away from residential dwellings. Though the feature will remain as a permanent reminder of the activity, the additional impact of the proposed new and modified piggery buildings in the longer term is considered to be of *minor impact*, due to the hedgerows, topography and colouring of the sheds.

7.5.4 Landscape Planning Impact

It is considered that the proposed development will have *no significant* landscape planning impacts. The development does not impinge on listed scenic views or prospects or on sensitive, vulnerable or designated landscapes.

7.5.5 Landscape and Visual Impact Summary

Given the nature and impact of the existing facility, it is considered that the proposed extension will not result in *major significant* overall *negative* landscape and visual impact. As a result it is considered that the proposal may be viewed as having an acceptable level of landscape and visual impact, though undoubtedly the proposal is to expand the capacity of the piggery operation

7.6 MITIGATION MEASURES

7.6.1 Landscape Treatments involving the Existing Piggery Operation and its Surrounds

Over the years Patrick Ryan has managed and improved the hedgerows around the piggery operation. While the planting is maturing and only has visual presence at proximity, it adds to the diversity of habitat and landscape structure in the immediate surroundings and with continued development will assist in visually enhancing the landscape.

In siting and designing the proposal to extend the piggery operation at Ballyfaskin, it is considered more appropriate in landscape and visual terms to incorporate the existing piggery operation feature and its setting rather than consider a new site location.

The existing piggery buildings has developed gradually over 20 years and is now as much a feature of the local landscape. The topography of the area and the hedgerows around the site results in the existing buildings being well screened from domestic dwellings in the area around the operation.

7.7 RESIDUAL IMPACTS

Following the construction of the proposed development, there will be no significant impact in an overall landscape context. The continued management of the hedgerows and the maintenance of the piggery buildings will have no significant impact in terms of landspace and visual impact.

SECTION B – THE NATURAL ENVIRONMENT

This section of the Environmental Impact Statement deals with the potential effects of the proposed scheme on the natural environment. The effects have been grouped as follows:

- **Impacts on the Terrestrial Environment including flora and fauna.**
- **Impacts on the Aquatic Environment**
- **Impacts on Soil, Geology and Hydrogeology**
- **Impacts on Climate**

The various aspects of the natural environment interact to some degree with each other so that assessing one aspect in isolation can be misleading. For example the survival of terrestrial fauna can be dependent on floral composition, which is in turn dependant on soil composition and groundwater levels. Similarly the diversity of aquatic flora and fauna will be impacted by both hydrology and the quality of waters receiving drainage from the proposed scheme.

Human Beings also interact with the natural environment, often by altering landuse and landscape patterns for the purpose of agriculture and settlement.

8 TERRESTRIAL ENVIRONMENT

8.1 INTRODUCTION

This Chapter outlines the flora and fauna currently present in the area of the proposed extension to the existing piggery operation and assesses the impact of the proposal on the terrestrial habitats and species identified. Mitigation measures have been proposed where feasible. The ecological assessment involved walking over the site to identify habitats and species of flora and fauna present in order to determining the ecological diversity of this area.

8.2 METHODOLOGY

8.2.1 Flora

The habitats present were recorded and a list of Floravascular plants, lichen and mosses was compiled. Other details noted during the assessment included recording the presence of habitats and flora species

Habitats have been classified in accordance to the standard recommended by The Heritage Council (Fossitt 2000). Plant nomenclature in this report follows Rose (2006) for vascular plants, Philips, (1980) for grasses, ferns, mosses and lichens. Attention is given to the possible presence of habitats, plant species that are legally protected under Irish and or European legislation. National Parks and Wildlife Service references to the site including maps of sites of conservation importance in the region and site synopsis were checked.

8.2.2 Birds

During the ecological assessment birds observations were recorded

- All species encountered (seen or heard) were recorded and where possible their abundance noted.
- Areas of Hedgerow within the survey area were surveyed

8.2.3 Mammals, Amphibians and Reptiles

The presence of mammals, amphibians and reptiles was surveyed by searching for direct observations and for signs of their presence such as feeding signs or dropping and dwellings.

8.2.4 Survey Limitations

The weather conditions were mild but breezy with occasional showers during the survey. It is not considered that limitations were associated with the survey of habitats and vegetation.

Every effort has been made to provide an accurate assessment of the situation pertaining to the site. However, an ecological survey can only assess a site at a particular time. This study is a snapshot in time and should not be regarded as a complete study.

8.4.2.2 Designated Sites

The will be no impact on designated sites as the nearest designated site is more the 4.1 kilometres away.

8.4.2.3 Birds

No birds of conservation concern were recorded onsite. No breeding birds of high conservation concern are likely to be impacted by the proposed expansion. The site does not hold of good quality breeding bird habitat which will be lost as a result of the development.

8.4.2.4 Mammals

The proposed development will result in a loss of improved agricultural land and this is considered to be an insignificant Impact.

8.5 MITIGATION MEASURES

The nature of the proposed development is such that the loss of improved agriculture with low ecological value is of insignificant impact and no mitigation is required.

8.6 CONSTRUCTION IMPACTS AND MITIGATION

8.6.1 Impacts

Construction consists of a number of activities which have the potential to affect flora and fauna e.g. site clearance, excavation and infill.

Site clearance has the largest impact on ecology, involving the removal of pre-existing habitats and considerable soil disturbance. It will have least impact on fauna if carried out in the August-November period, avoiding the main bird and mammal breeding time.

Excavation and infill require the use of heavy machinery which has to be stored and maintained on site, but also has to gain access to the working area. This may cause damage to a wider zone of vegetation, particularly in wet weather when compaction and physical damage is likely.

8.6.2 Mitigation

As a minimum, the contractor will comply with all legislative provisions relating to hedgerow/tree removal and the protection of birds and bats and shall have regard to reducing impacts on nesting birds and breeding/roosting bats.

8.7 RESIDUAL IMPACTS

There will be a permanent loss of habitat from beneath the footprint of the proposed expansion.

9 AQUATIC ENVIRONMENT

9.1 INTRODUCTION

The abundant supplies of surface and groundwater within Ireland dictate the importance of measures to protect the aquatic environment. The intense nature of agriculture combined with the topography in County Limerick has in the past presented problems whereby the aquatic environment has suffered from the adverse effects of inadequate mitigation measures in the protection of local watercourses against water pollution from agriculture sources.

However in recent years the combination of factors such as legislation, the REPS programme, catchment management initiatives and increased local authority inspections has led to improvement in the quality of many surface waters through improved agricultural practices in terms of land spreading and waste storage.

This self-regulating approach to water management was incorporated into the planning of the proposed development, and the developer already operates the existing piggery buildings on site to this principle.

9.2 DESCRIPTION OF EXISTING ENVIRONMENT

The site has no river or water bodies but contains a small drainage ditch which drains the site and surrounding agricultural land.

9.3 IMPACTS

9.3.1 Do-Nothing

Should the extension not be built there would be no loss or changes in the drainage from the site

9.3.2 Do-Something

9.3.2.1 General

The current proposals at Patrick Ryan piggery operation will increase the flow in the drainage ditch following rainfall as previously the rainfall would have percolated or evaporated within the area of the proposed development. Such potential impacts include loss or alteration of habitats and species, increased suspended solids, alteration of the hydrology and sediment deposition typical of the area of the ditch.

9.4 MITIGATION MEASURES

9.4.1 Pollutants and Waste

To prevent chemical pollution during the operation of the piggery operation, all fuels or chemicals kept on site will be stored in bunded containers. All major refuelling and maintenance events will be undertaken away from the site. Equipment will be regularly maintained and leaks repaired immediately away from the site if possible. Accidental spillages will be contained and cleaned up

immediately. Remediation measures will be carried out in the unlikely event of pollution of adjacent watercourses in accordance with the consultant's recommendations.

9.5 CONSTRUCTION IMPACTS AND MITIGATION

9.5.1 Impacts

9.5.1.1 Loss or alteration of habitats and species

There will be a loss of improved grassland habitats and species as a consequence of the expansion of the site. During period of rainfall an increase in surface water runoff will enter the drainage ditch on-site which may alter the habitat & flora present.

9.5.1.2 Increased suspended solids

The construction works associated with expansion of the piggery operation has the potential to cause the release of sediments into watercourses notably drainage ditches on site. It is predicted that this will be a short-term as the construction phase is short

9.5.1.3 Pollutants and waste

The likely sources of chemical contamination would be from site machinery and vehicles. Pollution could occur in a number of ways, such as neglected spillages, the storage, handling and transfer of oil and chemicals and refuelling of vehicles. Accidental leakage or discharge of chemicals and pollutants could cause changes in the pH of the water and could have a direct toxic impact on the fauna and flora at the location of the development and further downstream. If waters become polluted, species more tolerant to pollution can extend their distribution, thus altering the species composition of the watercourse.

9.5.2 Mitigation

9.5.2.1 Loss or alteration of habitat and species

To minimise the loss of the habitat and species, the area of construction should be kept to the minimum required. Construction should be approached from the existing piggery operation to avoid disturbing neighbouring habitats. However, since it is already a low ecological habitat, the impacts from the loss is not significant

9.5.2.2 Increased suspended solids

To minimise the amount of suspended solids released into the water column during construction, efforts should be made to minimise the area disturbed. Needless clearing and grading should be minimised and phased to limit exposure.

9.5.2.3 Pollutants and Waste

To prevent chemical pollution during the construction of the piggery buildings, the EPA guidance on storage of materials will be followed.

In addition, should contained chemical portable toilets be used, all sewage will be removed from the site to an authorised treatment works. No sewage will be discharged to watercourses.

9.6 RESIDUAL IMPACTS

Assuming all mitigation measures are put in place, there should be no residual impacts.

9.7 MONITORING

Routine (quarterly) monitoring of the drainage ditch should be conducted and will be part of the IPPC license requirements.

10 SOILS, GEOLOGY AND HYDROGEOLOGY

10.1 INTRODUCTION

This chapter outlines the environment assessment with regard to soils, geology and hydrogeology of the area. This report should be read in conjunction with the site layout plans for the proposed development and the project description sections of the Environmental Impact Statement. In the assessment, particular attention is focused on the likely presence of contaminated soils and groundwater and on sensitive receptors, such as groundwater dependent ecosystems, vulnerable aquifers or water supplies close to the site.

10.2 METHODOLOGY

This report is based on a desk study and a summary of the available and relevant data on the area:

- Geological Survey of Ireland (GSI), 1999. "Geology of the Shannon Estuary". Sheet 17. Scale 1:100,000.
- Geology of Tipperary: A Geological Description of Tipperary and adjoining parts of Laois, Kilkenny, Offaly, Clare and Limerick, with accompanying Bedrock Geology 1:100,000 Scale Map, Sheet 18
- GSI & Limerick County Council, 1998. County Limerick Groundwater Protection Scheme.
- GSI Groundwater Maps online at www.gsi.ie
- GSI, well records database.

This environmental impact assessment was prepared in accordance with Guidelines on the information to be contained in Environmental Impact Statements (EPA 2002) and Geology in Environmental Impact Statements, A Guide by the Institute of Geologists in Ireland (IGI, 2002).

10.3 DESCRIPTION OF EXISTING ENVIRONMENT

The natural topography of the site ranges from 92 to 114 meters. The topography of the land is relatively flat with a slight drop to the back of the site towards the proposed piggery buildings.

10.3.1 Soils and Subsoils

The soils in the area occur on flat and undulating relief at elevations varying from 40 to 200 meters.

The soils that occur in the general vicinity of Ballylanders Brown Earths (in places a strong tendency towards Brown Podzolics is apparent also. The soils are well drained, of shaly loam to sandy loam texture, and more usually shaly, sandy clay loam, and of medium base status; they have been classified as). They are derived directly from Silurian Shale, from colluvium of Silurian Shale origin and occasionally from drift composed principally of Silurian Shale and of either Saale or Weichsel Age. In every case, however, there is some influence of Old Red Sandstone which occurs on the crests of the hills and mountains.

The soils occur mostly at elevations less than 800 feet, on slopes of 0 to 18°. The profile is characterised by brown to dark-brown surface horizons with a moderate, fine, crumb structure. In general these horizons overlie a reddish-yellow (B) horizon with weak, fine, sub-angular blocky structure; in certain instances, however, the (B) horizon is weakly expressed. The profile contains appreciable quantities of small shale fragments which enhance the internal drainage. Root

development is good. In their overall species composition the grasslands on this series resemble those on the Derk Series. However, Agrostis tenuis (bent-grass) and Holcus lanatus (Yorkshire fog) are generally the dominant species; Lolium perenne (perennial rye-grass) is only present in small amount, and Cirsium arvense (creeping thistle) occurs rarely. See Figure 8 & 9

10.3.2 Bedrock Geology

Well records for the rocks of Silurian age in the south-east of the county indicate eight 'good' wells (including the Ballylanders public supply) in the Inchacoomb Member and 3 in the Ballygeana Formation. A specific capacity of 35 m3/d/m was calculated for the public supply in Ballylanders. The transmissivity from a ten hour pumping test was determined as being of the order of 32 m2/d [23–64 m2/d]. The only information available for the Hollyford rock unit in the Slieve Felim mountains is the site investigation undertaken for the proposed landfill. In four boreholes, permeabilities in the top 30 m of rock ranged from 4.2 x 10-9 m/s to 8.8 x 10-5 m/s (3.6 x 10-4 to 7.6 x 10-1 m/d). A zone of higher permeability (with measured permeabilities in a fifth borehole of 1.2 x 10-4 to 1.1 x 10-5 m/s), 150-200 m wide, 12-14 m deep and 2.2 km long was delineated on the site.

In general, the permeability of Silurian rocks is relatively low. However, permeabilities in the upper few metres are often high although they decrease rapidly with depth. Local zones of higher permeability will be present, usually due to faulting. It is likely that the rocks in south-eastern Limerick will be somewhat more jointed than in the Slieve Felim mountains as they have undergone a greater degree of structural deformation. Evidence of the relatively low permeabilities is provided by the drainage density and flashy runoff response to rainfall in areas underlain by Silurian rocks.

Examination of data in the GSI well database shows that water levels in Silurian rocks are shallow, usually less than 15 m below surface, although within the Inchacoomb Member they are a somewhat deeper. This may be attributed to higher permeabilities in this rock unit but may also be a reflection of topography; the Inchacoomb Formation, being the oldest rocks to crop out in the Galty anticline, are generally topographically higher than the rest of the formation.

While groundwater in these rocks is usually unconfined, clayey till and peat sometimes confine the groundwater and artesian flowing boreholes can be encountered in low lying areas.

The Silurian rocks in south-eastern Limerick i.e. the Inchacoomb Formation and the Ballygeana Formation, are classed as locally important aquifers which are moderately productive only in local zones (Ll). See Figure 7.

10.3.3 Hydrogeology

10.3.3.1 Aquifer Classification

Most of the GWB comprises rocks that are Ll : Locally important aquifer which are moderately productive only in local zones. In the southeast, small areas of Devonian Kiltorcan-type sandstone are classified as Rf: Regionally important fissured aquifers. Namurian Shales in the southwest corner and thin bands of Dinantian (early) Shales in the southeast are classified as Pl: Poor aquifers which are generally unproductive except for local zones. Also, there is less than 1 km2 of karstified limestone in the SE, and tiny areas in the NE of Volcanic rocks currently classified as a Lm: Locally important aquifer which is generally moderately productive

The dominant rock unit groups in the northern part of the GWB are the Dinantian Upper Impure Limestones. In the southeastern part, Devonian Old Red Sandstones, Silurian Metasediments and

Volcanics, and Dinantian Lower Impure Limestones predominate. Namurian Undifferentiated rocks occur in the southwest and centre. There are small areas of Dinantian (early) Sandstones, Shales and Limestones, Devonian Kiltorcan-type Sandstones, and Dinantian Pure Unbedded Limestones in the southern part of the GWB. In the northeast, there are tiny areas of Volcanic rocks. **See Figure 10**

10.3.3.2 Groundwater Levels

Within the Upper Impure Limestones (in the north of the GWB), groundwater levels generally range from between 5-15 mbgl, with the majority of values less than 9 mbgl. Deeper groundwater levels of around 20 mbgl are found just east of Charleville. Water levels are closer to the surface near the northern edge of the GWB, indicating a potential discharge zone near the junction with the North Kilmallock GWB. A hydrograph from a well in this area (shown below) displays a seasonal variation of about 2 m. In the low-lying areas, subsoils are thick and the dug wells are drawing water from perched water tables within the subsoils. Groundwater is frequently confined by the subsoils in this area, although unsaturated zones do exist in some areas.

In the upland areas, groundwater is unconfined. The water table ranges from ground level to more than 20 mbgl. Most groundwater levels are between 2-12 mbgl, with a median value of about 7 mbgl. Water levels are deeper (5-17 mgbl) in the highest areas than in the rest of the GWB. Dug wells in this area are probably tapping the true water table, and are sited in areas where it is close to the surface. Compartmentalisation due to faulting is indicated by two water level measurements of 22 mgbl measured in wells in Lower Impure Limestones.

Groundwater flow is influenced by topography and most flow is of a local nature. Unconfined groundwater flow paths are short (30-300 m), with groundwater discharging to the streams. Confined flow paths may be significantly longer. Overall, the groundwater flow direction is northwards

10.3.3.3 Groundwater Quality

The hydrochemistry of groundwater beneath the site is dominated by the presence of limestone in both the bedrock and subsoils and is hard, calcium bicarbonate type water. The principle contaminants of concern arising from the production process are high pH, alkalinity and aluminium, which is soluble at high pH.

The lower and upper impure limestone aquifers that form the bulk of the GWB have a calcium-bicarbonate signature, are hard (280-360 mg/l CaCO3) and alkaline (240-290 mg/l CaCO3), with high conductivities (630-660 µS/cm). Both iron and manganese can exceed allowable concentrations, with these components coming from the shales. Hydrogen sulphide may be problematic. The bedrock strata of these aquifers are calcareous.

Groundwaters in the Namurian rocks are slightly hard and have moderate alkalinities (no data for this aquifer exist in this GWB). Both iron and manganese can exceed allowable concentrations, these components coming from the shales. Reducing conditions may occur. Hydrochemical signatures varying from Ca-HCO3 to Na/K-HCO3 and alkalinities greater than total hardness can occur. This is typical of confined waters where ion exchange has occurred. The bedrock strata of this aquifer are siliceous.

In the Old Red Sandstones and Silurian rocks, groundwaters measured in this GWB have moderate hardness (160-220 mg/l CaCO3), alkalinity (160-240 mg/l CaCO3) and conductivity (360-410 µS/cm). The groundwater has a calcium-bicarbonate signature, which is likely to have been affected by carbonate in the subsoils. The bedrock strata of these aquifers are siliceous.

Surveyed 1840-1841
Revised 1904-1924
Levelled 1924

Record PLACE Map

ITM CENTRE PT. COORDS
578952,623421

DESCRIPTION

MAP SHEETS
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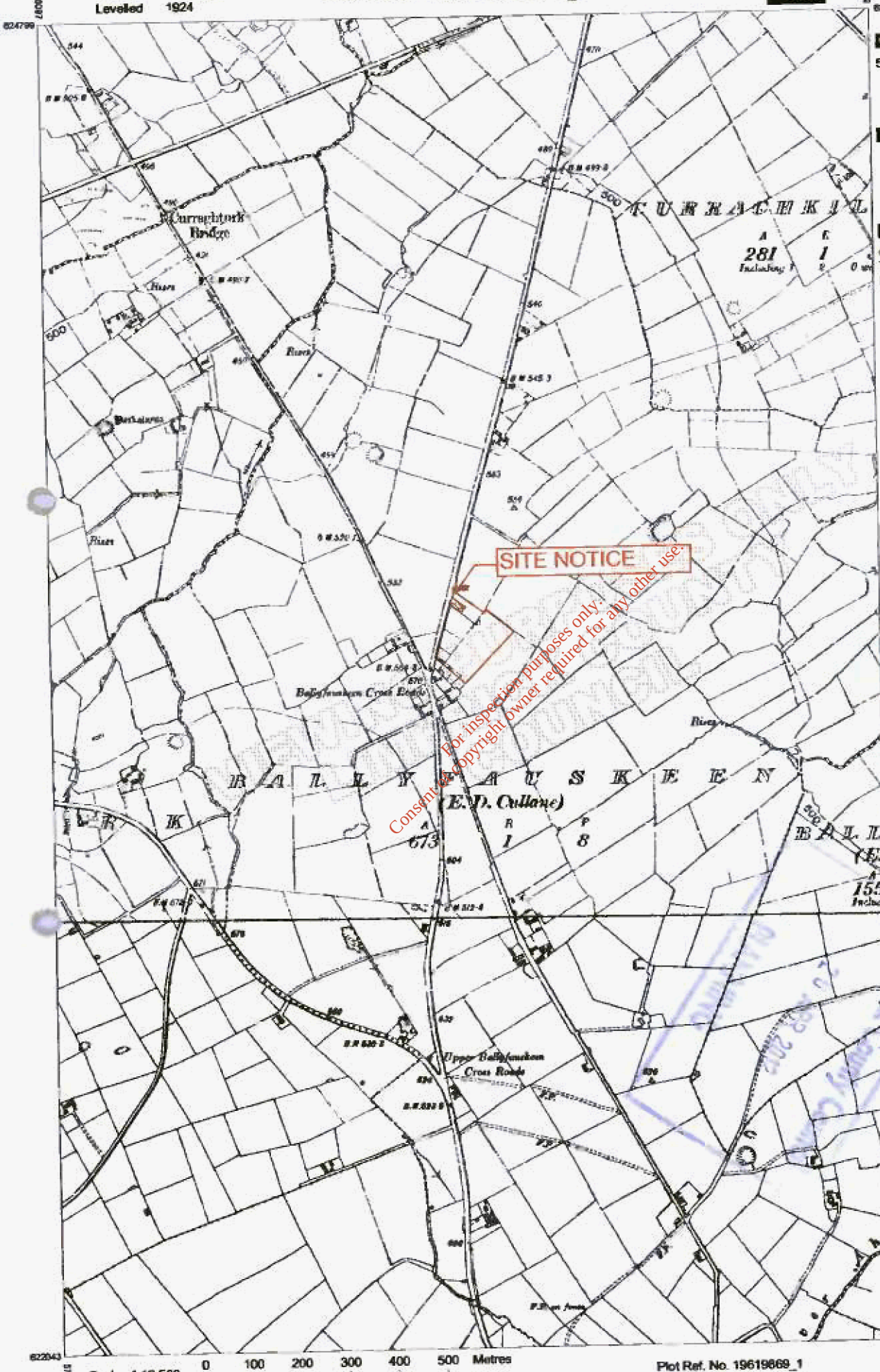
TY073+07 LK057
LK049



Authorised Internet Map

Scale:- 1:10,560
Scála:- 1:10,560

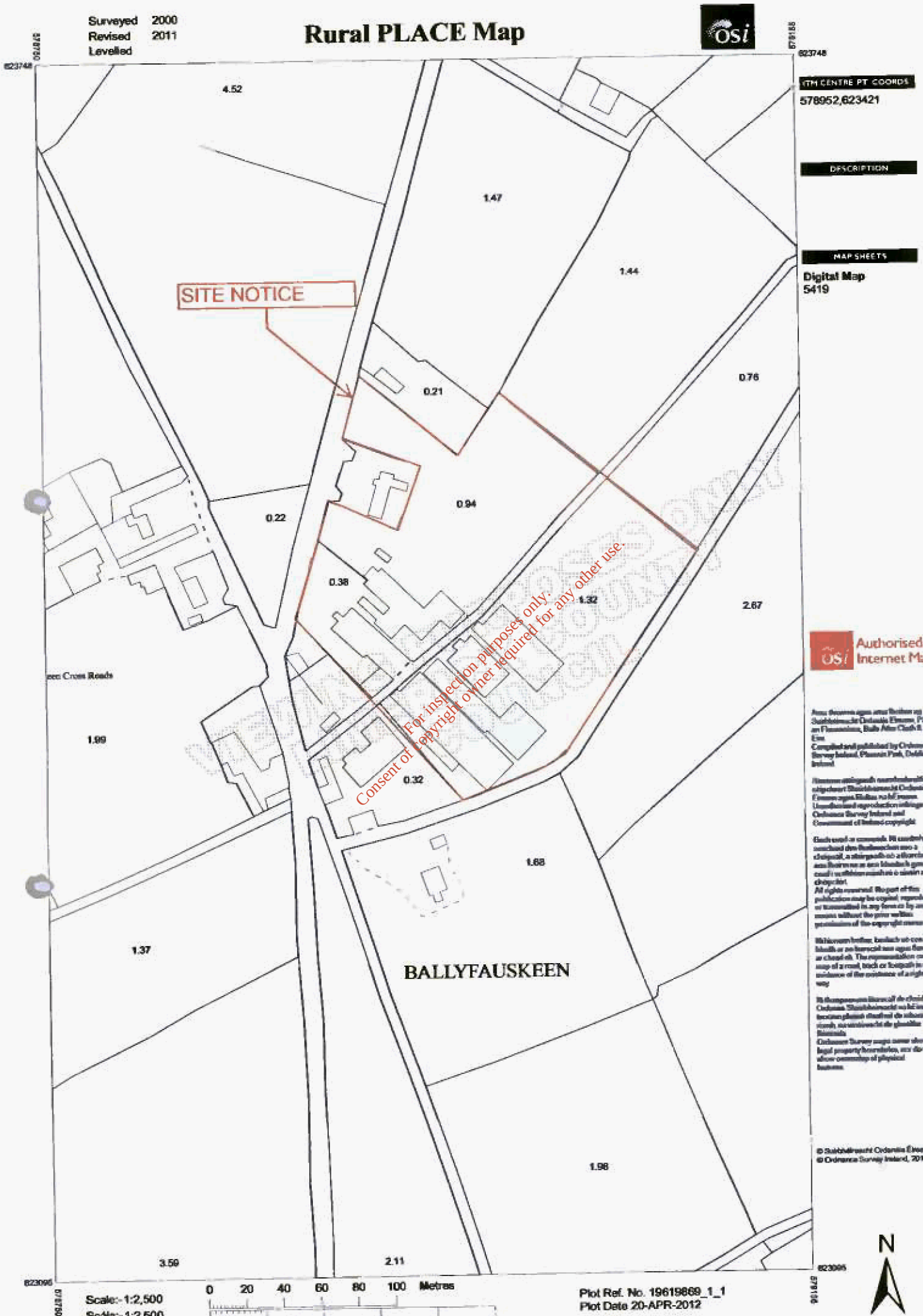
0 100 200 300 400 500 Metres
0 500 1,000 1,500 2,000 2,500 Feet

Plot Ref. No. 19619669_1
Plot Date 20-APR-2012

N

Surveyed 2000
Revised 2011
Levelled

Rural PLACE Map



ITM CENTRE PT COORDS
578952,623421

DESCRIPTION

MAP SHEETS
Digital Map
5419

Authorised Internet Map

Compiled and published by Ordnance Survey Ireland, Phoenix Park, Dublin 8, Ireland

The representation on this map of a road, track or footpath is not evidence of the existence of a right of way.

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Plot Ref. No. 19619869_1_1
Plot Date 20-APR-2012