

Chapter 12 Noise and Vibration

12.1. Introduction

RPS has been commissioned by Pragma Planning and Development Consultants Ltd to undertake a noise and vibration impact assessment in relation to the residential and mixed used development at Bowtown, Newtownards. The proposed site location and planning boundary is included in submitted drawings and figures.

The site currently consists of agricultural fields, a number of farm groups and individual residential dwellings.

This noise assessment has focused primarily on the following items:

- Noise impact associated with construction activities;
- Potential noise impact associated with increased traffic flows
- Suitability of site for residential purposes; and
- Potential plant/equipment noise impacts associated with the proposed mixed use development.

World Health Organisation (WHO) describes environmental noise generically as that emitted by all sources, except sources of occupational noise exposure in workplaces (WHO, 2018). The Environmental Noise Directive (EU, 2002) is more specific in its definition, considering environmental noise as unwanted or harmful outdoor sound created by human activity, such as noise emitted by different means of transport — road traffic, rail traffic, air traffic — and industrial activity.

World Health Organisation (WHO) states that “Excessive noise seriously harms human health and interferes with people’s daily activities at school, at work, at home and during leisure time. It can disturb sleep, cause cardiovascular and psychophysiological effects, reduce performance and provoke annoyance responses and changes in social behaviour.”

WHO Environmental Noise Guidelines for the European Region provide guidance on protecting human health from harmful exposure to environmental noise. They set health-based recommendations on average environmental noise exposure of five relevant sources of environmental noise. These sources are road traffic noise, railway noise, aircraft noise, wind turbine noise and leisure noise.

European Environment Agency (EEA) claim Environmental noise is a pervasive pollutant that adversely affects the health and well-being of European citizens and wildlife. Although noise is a product of many human activities, the most widespread sources of environmental noise are those related to transport. Long-term exposure to noise can cause a variety of health effects including annoyance, sleep disturbance, negative effects on the cardiovascular and metabolic system, as well as cognitive impairment in children.

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The specific objectives of the noise and vibration assessment are to:

- define the assessment methodology and significance criteria used in completing the noise and vibration impact assessment;
- describe the likely significant effects, including indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development,
- describe the mitigation measures proposed to address the likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

This Chapter is supported by Volume II Technical Appendices;

- Appendix 12:1: Baseline Noise Monitoring Survey Data and Analysis
- Appendix 12:2: Construction Noise Receptors

12.1.1 Potential Effects Scoped Out

Operational vibration affecting noise sensitive receptors has been scoped out as there are no known significant vibration sources associated with the proposed development. There are no significant operational vibration impacts. Baseline vibration monitoring was not undertaken within the proposed residential development site.

12.1.2 Study Area

The proposed development is located on the eastern boundary of Newtownards. It is approx. 600 meters north of the shoreline of Strangford Lough, bound to the north by the B172 Movilla Road and to the south by the Bowtown Road. The western boundary of the site is in close proximity to the residential Abbot Drive area and the eastern boundary is open countryside.

12.1.3 Project Description

The proposed development will occupy a land area of just over 41 hectares. It will comprise of 675 no dwellings. These will be a mix of apartments, town houses, semi-detached and detached houses. A mixed used centre is proposed for the core of the development and this is intended to meet local needs. A local distributor road will run through the development connecting Bowtown Road to Movilla Road, the road is to accommodate a bus route. A pedestrian and cycleway network is also to be provided.

The Concept Master Plan in Figure D shows a total of 684 units in a mix of 105 apartments and 579 dwellings, which in turn breakdown into 39 terraced town houses, 421 semi-detached houses and 119 detached houses.

The proposed development is located within the administrative area of Ards & North Down Borough Council.

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12.2 Methodology

12.2.1 Policy and Guidance

The noise assessment has considered the following relevant policy and guidance documents: -

- Noise Policy Statement for Northern Ireland (NI), Department of Environment (2014);
- Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment
- British Standard 8233: 2014 Sound Insulation and Noise Reduction for Buildings – Code of Practice (BS, 2014);
- World Health Organisation (WHO) – Guidelines for Community Noise (1999, 2011 and 2018);
- British Standard BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (BS, 2014+A1:2019);
- British Standard BS5228:2009 Noise and Vibration Control on Construction and Open Sites (BS, 5228);
- Sport England Artificial Grass Pitch (AGP) Acoustics – Planning Implications (New Guidance for 2015)
- Professional Practice Guidance on Planning & Noise - New Residential Development (May 2017)
- Calculation of Road Traffic Noise (CRTN) – Department of Transport (Welsh Office); and
- British Standard BS 7445-1 Description and measurement of environmental noise – Part 1: Guide to quantities and procedures (BS, 7445-1).

12.2.1.1 Noise Policy Statement for Northern Ireland

The Noise Policy Statement for Northern Ireland was published in September 2014 for the purposes of defining the Department of Environment's policy responsibility to manage environmental noise. Through the effective management and control of environmental, neighbour and neighbourhood noise the Noise Policy aims to:

1. Avoid or mitigate significant adverse impacts on health and quality of life;
2. Mitigate and minimise adverse impacts on health and quality of life: and
3. Where possible, contribute to the improvement of health and quality of life.

The guidance highlights the role of the planning system in preventing and minimising the impact of noise through its influence on the location, layout and design of new development and consideration of amenity impacts. The guidance document makes reference to the

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applicability of established concepts from toxicology which have more recently been applied to noise impacts, namely:

- No Observed Effect Level;
- Lowest Observed Adverse Effect Level (LOAEL); and
- Significant Observed Adverse Effect Level (SOAEL)

The document acknowledges that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations and hence all situations must be judged on their own merits. This guidance document defines the general noise context that has been applied in this assessment and has been used in addition to a range of other specific noise guidance documents which provide specific technical guidance on specific aspects of the noise assessment.

12.2.1.2 Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment

IEMA noise impact assessment guidelines address the key principles of noise impact assessment and are applicable to development proposals where noise effects are likely to occur.

The guidelines provide specific support on how noise impact assessment fits within the Environmental Impact Assessment (EIA) process. They cover:

- how to scope a noise assessment;
- issues to be considered when defining the baseline noise environment;
- prediction of changes in noise levels as a result of implementing development proposals; and
- definition and evaluation of the significance of the effect of changes in noise levels (for use only where the assessment is undertaken within an EIA).

The guidelines define core methods and techniques, used within the noise impact assessment process, and endeavour to highlight their limitations, where relevant. They can be applicable to all stages of a project, from construction through operation to restoration and decommissioning.

12.2.1.4 British Standard 8233:2014 Sound Insulation and Noise Reduction for Buildings – Code of Practice

BS8233:2014 provides guidance values for a range of ambient noise levels within residential properties as shown in Table 12.1 below.

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Table 12. 1: Internal Ambient Noise Levels

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35dB $L_{Aeq, 16hr}$	-
Dining	Dining room/area	40dB $L_{Aeq, 16hr}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq, 16hr}$	30dB $L_{Aeq, 8hr}$

The standard allows for a further relaxation in standards of up to 5dB where "development is considered necessary or desirable". In relation to external amenity areas such as gardens and patios, the standard states that it is desirable that external noise does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$.

12.2.1.5 World Health Organisation (WHO) – Guidelines for Noise

In the World Health Organisation (WHO) Guidelines for Community Noise (1999), a L_{Aeq} threshold daytime noise limit of 55 dB is suggested for outdoor living areas in order to protect the majority of people from being seriously annoyed. A second daytime limit of 50 dB is also given as a threshold limit for moderate annoyance.

The guidelines suggest that an internal L_{Aeq} not greater than 30 dB for continuous noise is needed to prevent negative effects on sleep. This is equivalent to a façade level of 45 dB L_{Aeq} , assuming open windows or a free-field level of about 42 dB L_{Aeq} . If the noise is not continuous, then the internal level required to prevent negative effects on sleep is a $L_{Amax,fast}$ of 45 dB. Therefore, for sleep disturbance, the continuous level as well as the number of noisy events should be considered.

The WHO Night Noise Guidelines for Europe was published in 2009 on the back of extensive research completed by a WHO working group. Considering the scientific evidence on the threshold of night noise exposure indicated by $L_{night, outside}$ as defined in the Environmental Noise Directive [2002/49/EC], a $L_{night, outside}$ of 40dB should be the target of the night noise guideline (NNG) to protect public, including the most vulnerable groups such as children, the chronically ill and the elderly. An interim target of 55dB is recommended where the NNG cannot be achieved. These guidelines are applicable to Member States of the European Region and maybe considered as an extension to the previous WHO Guidelines for Community Noise (1999).

In 2011, the WHO published the *Methodological Guidance for Estimating the Burden of Disease from Environmental Noise*. This document outlines the principles of quantitative assessment of the burden of disease from environmental noise, describes the status in terms of the implementation of the European Noise Directive and reviews evidence on exposure-response relationships between noise and cardiovascular diseases.

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In 2018, the WHO Regional Office for Europe has developed guidelines, based on the growing understanding of health impacts of exposure to environmental noise. The main purpose of these guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from various sources: transportation (road traffic, railway and aircraft) noise, wind turbine noise and leisure noise. Leisure noise in this context refers to all noise sources that people are exposed to due to leisure activities, such as attending nightclubs, pubs, fitness classes, live sporting events, concerts or live music venues and listening to loud music through personal listening devices.

The 2018 guidelines are published by the WHO Regional Office for Europe. In terms of their health implications, the recommended exposure levels can be considered applicable in other regions and suitable for a global audience.

12.2.1.6 British Standard BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

BS4142:2014+A1:2019 describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

- sound from industrial and manufacturing processes;
- sound from fixed installations which comprise mechanical and electrical plant and equipment;
- sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

BS 4142 also provides procedures in determining if the noise in question is likely to give rise to complaints from residents in the vicinity.

BS 4142 states that one should 'obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level and consider the following:

- a) Typically, the greater this difference, the greater the magnitude of the impact.
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- c) A difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context.

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- d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

The aforementioned rating level is based upon the specific noise level of the noise source in question. A correction should be applied to the specific noise level to obtain an increased rating level if 'a tone, impulse or other characteristic occurs, or is expected to be present, for new or modified sound sources. To summarise, BS4142 section 9.2 advises the following in regards to corrections for acoustic characteristics:

- Tonality – for sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible.
- Impulsivity – A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level., Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.
- Other sound characteristics – Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.
- Intermittency – When the specific sound has identifiable on/off conditions, if the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

12.2.1.7 British Standard BS5228:2009+A1:2014 Noise and Vibration Control on Construction and Open Sites

This British standard consists of two parts and covers the need for protection against noise and vibration of persons living and working in the vicinity of construction and open sites. The standard recommends procedures for noise and vibration control in respect of construction operations and aims to assist architects, contractors and site operatives, designers, developers, engineers, local authority environmental health officers and planners.

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Part 1 of the standard provides a method of calculating noise from construction plant, including:

- Tables of source noise levels
- Methods for summing up contributions from intermittently operating plant
- A procedure for calculating noise propagation
- A method for calculating noise screening effects
- A way of predicting noise from mobile plant, such as haul roads.

The standard also provides guidance on legislative background, community relations, training, nuisance, project supervision and control of noise and vibration.

The ABC method outlined in Section E3.2 has been used for the purposes of determining whether the predicted noise levels from the construction activities will result in any significant noise impact at the nearest noise sensitive properties. Table 12. 2 outlines the applicable noisethreshold limits that apply at the nearest noise sensitive receptors. The determination of whatcategory to apply is dependent on the existing baseline ambient (L_{Aeq}) noise level (rounded to the nearest 5dB) at the nearest noise sensitive property.

For daytime, if the ambient noise level is less than the Category A threshold limit, the Category A threshold limit (i.e. 65dB) applies. If the ambient noise level is the same as the Category A threshold limit, the Category B threshold limit (i.e. 70dB) applies. If the ambient noise level is more than the Category A threshold limit, the Category C threshold limit (i.e. 75dB) applies.

Table 12. 2: Noise Threshold Limits at the Nearest Sensitive Receptors for Construction Activities

	Threshold Limits [dB(A)]		
	Category A	Category B	Category C
Night-time (23:00 – 07:00)	45	50	55
Evening and Weekends (19:00-23:00 Weekdays, 13:00-23:00 Saturdays, 07:00-23:00 Sundays)	55	60	65
Weekday daytime (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75

12.2.1.8 Sport England Artificial Grass Pitch (AGP) Acoustics–Planning Implications (New Guidance for 2015)

Sport England Design Guidance note aims to promote the general understanding in relation to noise from the design concepts, planning technical issues, and provides details of acoustic implications associated with artificial grass pitch facilities.

Appropriate noise criteria and assessment methods are detailed within the guidance. The guidance also details noise reduction measures that can be applied in particular for noise sensitive locations.

12.2.1.9 Professional Practice Guidance on Planning & Noise - New Residential Development (May 2017)

The Institute of Acoustics, the Association of Noise Consultants and the Chartered Institute of Environmental Health have joined to produce a Professional Practice Guidance (ProPG) focussing on proposed new residential development and existing transport noise sources. It presents cross-sectoral guidance that seeks to assist and increase the consistency of plan-making and decision-making.

The ProPG follows a systematic, proportionate, risk-based, 2-stage approach that has been developed by the Working Group and subsequently refined following initial formal consultation with members of the sponsor organisations.

The two stages of the approach are:

- Stage 1- an initial assessment where external noise is rated against four Noise RiskCategories (NRCs);
- Stage 2- a systematic consideration of four key elements.

The four key elements in Stage 2 of the recommended approach are:

- Element 1- demonstrating a 'Good Acoustic Design Process';
- Element 2- observing internal 'Noise level Guidelines';
- Element 3- undertaking an 'External Amenity Area Noise Assessment'; and
- Element 4- consideration of 'Other Relevant Issues'.

The approach is underpinned by the preparation and delivery of one of two levels of 'Acoustic Design Statement' (ADS).

An ADS for high risk site should be more detailed than a low risk site, and is not necessary for a site assessed as negligible risk.

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Table 12. 3: Stage 1 Initial Site Risk Assessment

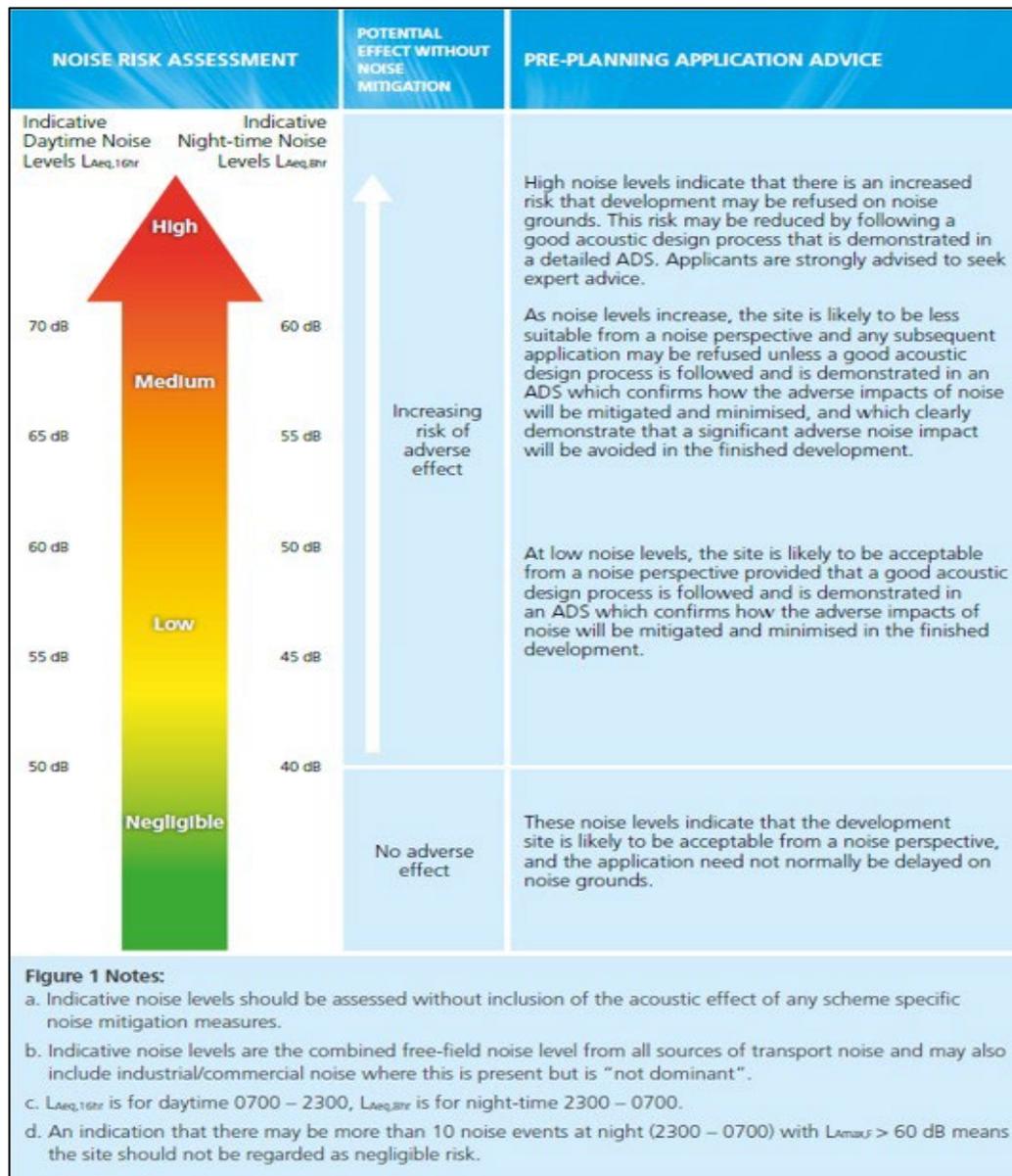
Noise Risk Category	Potential Effect is Unmitigated	Pre-planning Application Guidance
<p>0 - Negligible</p> <p>$L_{Aeq, 16hr}$</p> <p>$<50dB_{L_{Aeq, 8hr}}$</p> <p>$<40dB$</p>	<p>May be noticeable but no adverse effect on health and quality of life</p>	<p>In this category the development is likely to be acceptable from a noise perspective, nevertheless a good acoustic design process is encouraged to improve the existing environment and/or safeguard against possible future deterioration and to protect any designated tranquil areas. A noise assessment may be requested to demonstrate no adverse impact from noise.</p> <p>Application need not normally be delayed on noise grounds.</p>
<p>1 - Low</p> <p>$L_{Aeq, 16hr}$ 50-63dB</p> <p>$L_{Aeq, 8hr}$ 40-55dB</p>	<p>Adverse effect on health and quality of life</p>	<p>In this category the development may be refused unless a good acoustic design process is followed and is demonstrated via a Level 1 Acoustic Design Statement which confirms how the adverse impacts of noise on the new development will be mitigated and minimised and that a significant adverse noise impact will not arise in the finished development. Planning conditions and other measures to control noise may be required.</p>
<p>2 - Medium</p> <p>$L_{Aeq, 16hr}$ 63-69dB</p> <p>$L_{Aeq, 8hr}$ 55-60dB</p> <p>L_{AFmax} $>80dB$</p>	<p>Significant adverse effect on health and quality of life</p>	<p>In this category the development is likely to be refused unless a good acoustic design process is followed and is demonstrated via a Level 2 Acoustic Design Statement which confirms how the adverse impacts of noise on the new development will be mitigated and minimised, and clearly demonstrates that a significant adverse noise impact will not arise in the finished development. Planning conditions and other measures to control noise will normally be required.</p>
<p>3 - High</p> <p>$L_{Aeq, 16hr} >69dB$</p> <p>$L_{Aeq, 8hr} >60dB$</p> <p>$L_{AFmax} >80dB$</p>	<p>Unacceptable adverse effect on health and quality of life</p>	<p>In this category the development is very likely to be refused on noise grounds, even if a good acoustic design process is followed and is demonstrated via a Level 2 Acoustic Design Statement. Applicants are advised to seek expert advice on possible mitigation measures. Advice on the circumstances when the refusal of new housing on noise grounds should normally be anticipated is included in ProPG.</p>

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Figure 12. 1 summarises the Stage 1 Initial Risk Assessment, including indicative noise levels for each of the three Noise Risk Categories (NCRs) derived from current guidance documents and experience.

Figure 12. 1: Initial Risk Assessment



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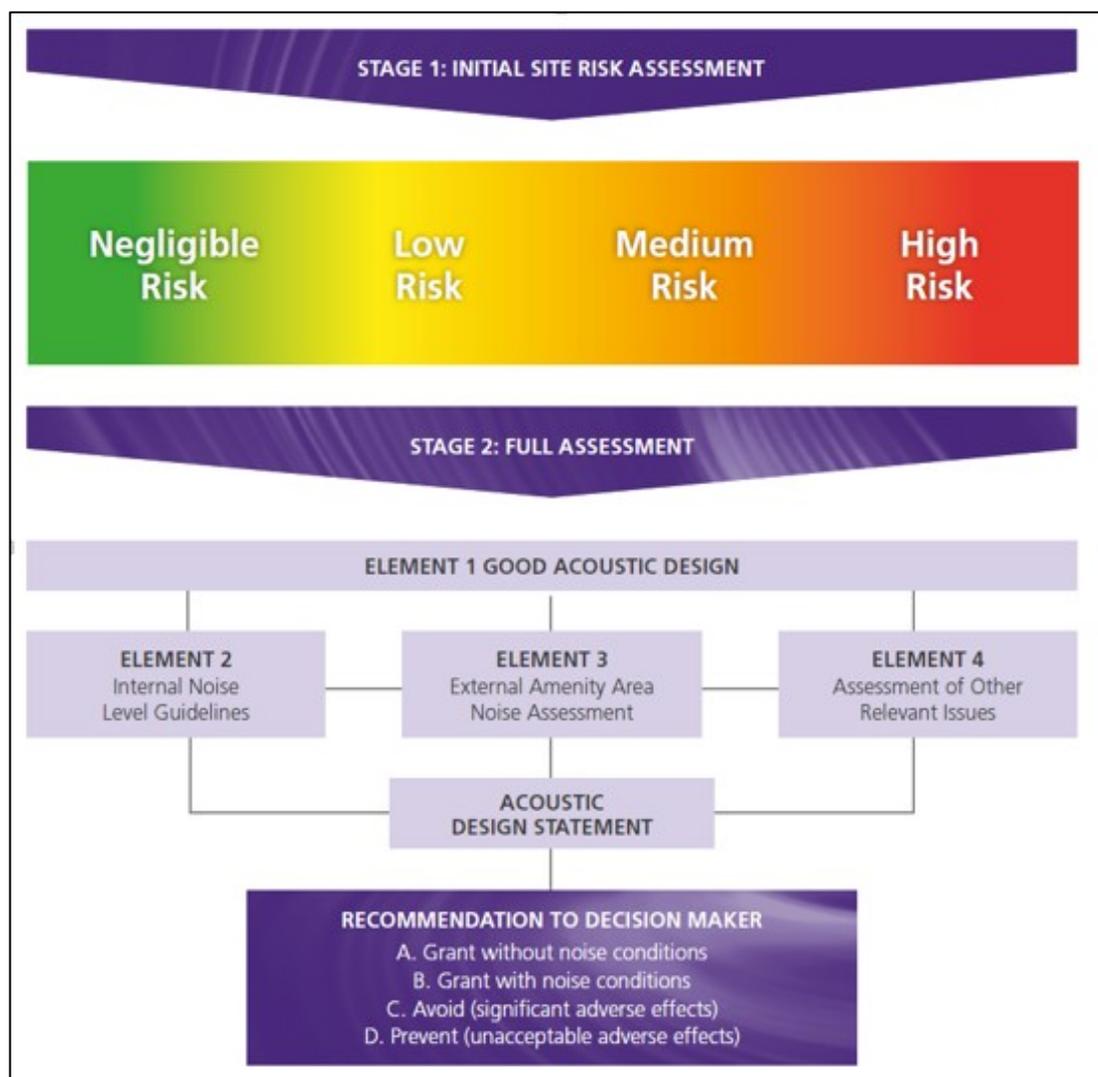
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Stage 2 provides recommendations to the decision maker on one of four possible recommendations:

- A Planning consent may be granted without any need for noise conditions;
- B Planning consent may be granted subject to the inclusion of suitable noise conditions;
- C Planning consent should be refused on noise grounds in order to avoid significant adverse effects; or
- D Planning consent should be refused on noise grounds to prevent unacceptable adverse effects.

Summary of ProPG overall approach is shown below in Figure 12. 2.

Figure 12. 2: Summary of ProPG Approach



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Supplementary Document 1 Planning and Noise Policy and Guidance

This supplementary document provides:

- Brief history of guidance of noise and planning,
- Current planning regime in England,
- Noise Policy Statement in England,
- Other sources of relevant planning practice guidance,
- Other relevant aspects of the Planning Process in England,
- Use of planning conditions and obligations,
- the Protection and Enhancement of the Local Acoustic Environment; and
- Other Noise Sensitive Development.

Supplementary Document 2 Good Acoustic Design

This supplementary document provides acoustic design advice and the following:

- Useful sources of information,
- General principles of good design,
- Good Acoustic Design Award Scheme (awaiting development).

12.2.1.10 Calculation of Road Traffic Noise (CRTN) – Department of Transport(Welsh Office)

This Calculation of Road Traffic Noise (CRTN) guidance document outlines the procedures to be applied for calculating noise from road traffic. These procedures are necessary to enable entitlement under the Noise Insulation Regulations (NI) 1995 to be determined but they also provide guidance appropriate to the calculation of traffic noise for more general applications e.g. environmental appraisal of road schemes, highway design and land use planning. The document consists of three different sections, covering a general method for predicting noise levels at a distance from a highway, additional procedures for more specific situations and a measurement method for situations where the prediction method is not suitable. The prediction method constitutes the preferred calculation technique but in a small number of cases, traffic conditions may fall outside the scope of the prediction method and it will then be necessary to resort to measurement. The prediction method has been used in this instance to determine the likely noise impact from traffic flow increases as a result of the proposed development.

12.2.1.11 British Standard BS 7445-1:2003 Description and Measurement of Environmental Noise – Part 1: Guide to Quantities and Procedures (BS, 7445-1)

British Standard BS7445 provides the framework within which environmental noise should be quantified. BS 7445: Part 1 provides guidance to quantities and procedures in relation to environmental noise monitoring. BS7445-1 states that sound level meters that are used should

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conform to specifications of Class or Type 1 (or Class or Type 2 as a minimum) as given in BESN 61672.

The Class of a noise level meter describes its accuracy as defined by the relevant international standards. Sound level meters are defined by International Standards such as IEC 61672-1:2013 (or BS EN61672-1:2003). These standards define a wide range of complex accuracy, performance and calibration criteria that instruments must meet to be fit for purpose. Within the Standard, there are two allowable levels of tolerance and these are known as Class 1 and Class 2. Class 1 is more accurate than Class 2.

These Class 1 and Class 2 tolerances are necessary as a way of dealing with variations in the instruments. The variations are caused by the different electronic components used inside the sound level meters and because of the way different meters have been designed and verified. Even the test equipment used to check the sound level meters during manufacture will introduce some variation.

All equipment shall be calibrated and the configuration for calibration shall be in accordance with the manufacturer's instructions. A comprehensive recalibration at certain time intervals (for example annually) may be prescribed by authorities responsible for the use of the measurement results. A field check shall be made by the user at least before and after each series of measurements, preferably including an acoustic check of the microphone

Meteorological conditions are not prescribed but it is recommended that wind speed should not exceed 5 m /s at height of 3-11m above ground, any temperature inversions near ground, or heavy precipitation.

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12.2.2 Assessment Criteria and Assignment of Significance

In keeping with the typical scope of an EIA, the emphasis of this Chapter is on the assessment of the potential effects of the proposed development upon the surrounding environment (nearest existing noise sensitive receptors) and on future occupants of the proposed residential development.

As detailed in IEMA Guidelines for Environmental Noise Impact Assessment the following terminology and definitions are detailed as:

- Noise Impact -The difference in the acoustic environment before and after the implementation of the proposals (also known as the magnitude of change). This includes any change in noise level and in other characteristics/features, and the relationship of the resulting noise level to any standard benchmarks.
- Noise Effect -The consequence of the noise impact. This may be in the form of a change in the annoyance caused, a change in the degree of intrusion or disturbance caused by the acoustic environment, or the potential for the change to alter the character of an area such that there is a perceived change in quality of life. This will be dependent on the receptor and its sensitivity.
- Significance of Effect -The evaluation of the noise effect and, particularly if the noise impact assessment is part of a formal EIA, deciding whether or not that impact is significant.

Receptor Sensitivity Criteria

Sensitive receptors, in the context of noise and vibration, are typically residential premises but can also include schools, places of worship and noise sensitive commercial premises. This is taken from the Scottish Government's Technical Advice Note on Assessment of Noise, Table 2.1 Level of sensitivity associated with various examples of noise sensitive receptors. Section 2.21 of TAN States "There are three levels of sensitivity; "high" "medium" and "low". The ranking is primarily based on the relationship between the amenity associated with a NSR and its susceptibility to noise."

TAN Chapter 2, Table 2.1 Level of Sensitivity Associated with Various Examples of Noise Sensitive Receptors provides sensitivity, description and examples of noise sensitive receptors. There is currently no equivalent reference document in Northern Ireland. Therefore, sensitivity of receptors, as defined in TAN has been used as reference criteria for sensitivity of receptors within this chapter.

Although this is not Northern Irish guidance, the assigned sensitivities are commonly used for Noise Impact Assessments across the UK. The sensitivity of receptors to noise and vibration during construction and operation phase of the Proposed Development is defined below in Table 12. 4.

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Table 12. 4: Criteria to Define Receptor Sensitivity (Ref: TAN Assessment of Noise)

Sensitivity	Description	Examples of NSR
High	Receptors where people or operations are particularly susceptible to noise	Residential, including private gardens where appropriate. Quiet outdoor areas used for recreation Conference facilities Theatres/Auditoria/Studios Schools during the daytime Hospitals/residential care homes Places of worship
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance	Offices Bars/Cafes/Restaurants where external noise may be intrusive. Sports grounds when spectator noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, golf, bowls)
Low	Receptors where distraction or disturbance from noise is minimal	Buildings not occupied during working hours Factories and working environments with existing high noise levels Sports grounds when spectator noise is a normal part of the event Night Clubs

There are residential properties identified in the vicinity of the Proposed Development study area. Therefore, all noise receptors are classified as having a sensitivity of 'high'.

Magnitude of Impact / Level of Significance

Construction Noise

Demolition and construction noise comprises both plant noise and site traffic noise. The construction noise 'of effect' for this assessment is based on the '5dB change' method in BS5228-1:2009 2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise' which is summarised in Table 12.5 below. On account of the temporary nature of construction activities, higher noise threshold limits apply to construction phase activities as compared to permanent operational phase activities.

BS 5228:2009+A1:2014 does not contain any significance criteria equivalent to what is presented in Table 12. 2, although examples of how limits of acceptability have been applied historically and some examples of assessing significance are presented. In this case Example Method 2, which refers to change of 5dBA in the ambient noise level, has been used to assess the effects at residential receptors.

Noise levels generated by construction activities are deemed to be significant if the total noise (pre-

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construction baseline plus construction noise) exceeds the pre-construction baseline by more than 5dBA subject to the lower cut-off value of 65dBA noise from construction activities alone.

This classifies the magnitude of effect based on the sound level difference between the ambient noise level with and without construction. This is calculated by finding the difference between the baseline ambient level and the total level (construction noise plus baseline ambient level) at each location.

Table 12. 5: Magnitude of Impact: Demolition and Construction Noise (Ref: BS 5228 Part 1)

Sound Level Difference between Ambient Noise and Total Noise (dB, LAeq)	Total Daytime Noise Level (dB LAeq, 12h) (Ambient and Construction Noise)	Magnitude of Impact
< 0 dB	< 65 dB (lower cut-off level)	Very Low
0 - 5 dB	65 - 70 dB	Low
5 - 10 dB	70 - 75 dB	Medium
> 10 dB	> 75 dB	High

Traffic Noise

Operational traffic magnitude of effect is quantified by the long-term change in traffic noise level based on the guidance in the 'Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7, LA 111, Noise and Vibration'.

CRTN is the standard noise guidance document for predicting traffic noise levels from traffic flow information and other relevant road topographical information. While the CRTN provides a methodology for predicting traffic noise levels, it does not provide significance criteria for assessing changes in traffic noise levels.

It is generally accepted that changes in noise levels of 1 dBA or less are imperceptible, and changes of 1 to 3 dBA are not widely perceptible. The operational traffic magnitudes of effect are given in Table 12. 6.

Table 12. 6: Magnitude of Impact: Operational Traffic

Change in Traffic Basic Noise Level (dB LA10,18h or Lnight)	DMRB Classification	Magnitude of Impact
Less than 3.0	Negligible	Very Low
3.0 - 4.9 dB	Minor	Low
5.0 - 9.9 dB	Moderate	Medium
10+ dB	Major	High

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Table 12. 7 and Table 12. 8 present the magnitude noise impacts for both short-term changes in traffic noise levels and long-term changes in traffic noise levels. The short-term criteria is used for the purposes of assessing the construction phase noise levels and the commencement of operational phase in the year of opening, while the long term criteria has been used for the purposes of assessing long term operational phase traffic noise levels 10 years after the year of opening.

An additional column has been included in Tables 12.7 and 12.8 to link the magnitude level defined in the DMRB with the significance criteria outlined in Table 12.11.

The magnitude of change shall be defined in accordance with Table 12.7 for short term and Table 12.8 for long term, as outlined below.

Table 12. 7: Magnitude of Change – Short Term

Short Term Magnitude	Short term noise change (dB LA10,18hr or Lnight)
Major	Greater than or equal to 5.0
Moderate	3.0 to 4.9
Minor	1.0 to 2.9
Negligible	less than 1.0

Table 12. 8: Magnitude of Change - Long Term

Long Term Magnitude	Short Term Noise Change (dB LA10,18hr or Lnight)
Major	Greater than or equal to 10.0
Moderate	5.0 to 9.9
Minor	3.0 to 4.9
Negligible	less than 3.0

Operational Phase Noise

Operational phase internal ambient noise levels within proposed residential properties are assessed against BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings' and the World Health Organisation (WHO) 'Guidelines for Community Noise'.

No magnitude of effect is given in BS8233 or WHO guidelines. Therefore, where the target levels are met, the magnitude of effect is considered to be very low. As stated in BS 8233, a 5 dB exceedance is still considered to be acceptable.

Operational phase noise levels in external amenity areas are assessed against BS8233:2014 and WHO Guidelines for Community Noise. No magnitude of effect is given in BS8233 or WHO guidelines. Therefore, where the target levels are met the magnitude is effect is considered to be very low.

The internal ambient noise levels and the associated magnitude of effect used in this assessment are summarised in Table 12. 9.

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Table 12. 9: Internal Ambient Noise Levels in Proposed Residential Properties and Magnitude of Effect

Internal Noise level, $L_{Aeq,T}$		Magnitude of Effect
Daytime (07:00 – 23:00)	Night-time (23:00-07:00)	
≤35 dB	≤30 dB	Negligible
36-40 dB	31-35 dB	Low
41-45 dB	36-40 dB	Medium
>45 dB	>40 dB	High

Operational phase noise levels in external amenity areas are assessed against BS8233:2014 and WHO Guidelines for Community Noise. No magnitude of effect is given in BS8233 or WHO guidelines. Therefore, where the target levels are met the magnitude of effect is considered to be very low. The external amenity area ambient noise levels and the associated magnitude of effect are summarised in Table 12. 10.

Table 12. 10: External Amenity Noise Levels and Magnitude of Effect

External Noise Level, $L_{Aeq, T}$	Magnitude of Effect
≤50 dB	Negligible
51-55 dB	Low
56-60 dB	Medium
>60 dB	High

Significance Criteria

Following the identification of receptor importance and magnitude of the effect, it is possible to determine the significance of the impact. TAN Chapter 2 Table 2.6 Significance of Effects provides the framework in determining the level of significance relating the magnitude with the sensitivity of the receptor. The significance of the effect is determined as a function of the sensitivity of the receptor and the magnitude of impact the receptor is exposed. The significance of effects for receptors of high sensitivity are summarised below in Table 12. 11.

Table 12. 11: Matrix for Determining Significance of Effect for Receptors of High Sensitivity (Ref: TAN Table 2.6)

Magnitude of Impact (Beneficial or Adverse)	Significance of Effect for Receptors of High Sensitivity
Major	Large or Very Large
Moderate	Moderate or Large
Minor	Slight/ Moderate
Negligible	Slight
No Change	Neutral

In line with the guidance:

- Very Large: These effects represent key factors in the decision-making process. They are generally, but not exclusively associated with impacts where mitigation is not practical or would be ineffective

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-
- Large: These effects are likely to be important considerations but where mitigation may be effectively employed such that resultant adverse effects are likely to have a Moderate or Slight significance
 - Moderate: These effects, if adverse, while important, are not likely to be key decision making issues
 - Slight: These effects may be raised but are unlikely to be of importance in the decision making process
 - Neutral: No effect, not significant, noise need not be considered as a determining factor in the decision making process

Effects are considered to be significant when identified as likely to have a Moderate, Large or Very Large Effect.

12.3. Baseline Noise Monitoring

Baseline noise refers to the noise environment in an area prior to the construction and/or operation of a proposed (or new) development that may affect it.

12.3.1 Baseline Noise Monitoring Survey

A baseline noise monitoring survey consisting of unattended noise measurements was conducted within the proposed development site.

The purpose of the noise monitoring surveys was to determine the baseline noise levels at the nearest noise sensitive receptors to the proposed development site and future occupants of the residential development and to determine the following;

- The applicable BS 5228 construction noise threshold limit in accordance with British Standard BS5228, Code of Practice of Noise and Vibration Control on Construction and Open sites; and
- The potential noise impact associated with the operational phase of the proposed mixed use development in accordance with British Standard 8233:2014 Sound Insulation and Noise Reduction for Buildings and World Health Organisation (WHO) - Guidelines for noise.

The weather conditions during the attended and unattended noise monitoring were in accordance with the requirements of BS7445: Description and Measurement of Environmental Noise.

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12.3.2 Noise Monitoring Locations

A baseline noise monitoring survey consisting of unattended noise measurements was conducted within the proposed development site. The baseline Noise Monitoring Locations (NML) are shown in Appendix 12.1 Baseline Noise Monitoring Survey Data and Analysis.

The unattended noise monitoring was located at four different locations within the proposed site boundary. All four locations were chosen in order to be representative of the noise environment at the nearest portion of the proposed development to the dominant noise source (i.e. road traffic noise). This baseline noise monitoring survey included both daytime and night time noise monitoring.

A description and the dates of the noise monitoring survey are summarised below in Table 12.12.

Table 12.12: Noise Monitoring Locations and Survey Dates

Noise Monitoring Location	Description of Noise Monitoring Location	Noise Monitoring Survey Dates (2019)
1	Northern boundary of the proposed development site in close proximity to the B172 Movilla Road.	28 th May – 30 th May
2	Centre of the proposed development site, near a derelict farm building. The surrounding area was agricultural farm land.	28 th May – 30 th May
3	South eastern boundary of the proposed development site. The surrounding area was agricultural farm land.	10 th June – 13 th June
4	NML 4 was located along a hedgerow at the south western boundary of the proposed development site. It was in close proximity to the Ballyreagh Road and residential properties along Abbot Drive.	10 th June – 13 th June

12.3.3 Monitoring Methodology

At each NML the microphone was placed at a height of 1.2 - 1.5m above ground level, and equipped with all-weather wind shield which also provides water resistance. The proprietary wind shield used is certified by the manufacture as meeting Type 1 / Class 1 precision standards. The sound level meter was accurately calibrated before and after use with no drift observed. The weather conditions during the unattended noise monitoring were in accordance with the requirements of BS7445: Description and Measurement of Environmental Noise.

The following parameters were recorded during each monitoring period:

L_{Aeq} The continuous equivalent A-weighted sound pressure level. This is an “average” of the sound pressure level.

L_{Amax} This is the maximum A-weighted sound level measured during the sample period.

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L_{amin} This is the minimum A-weighted sound level measured during the sample period.

L_{A10} This is the A-weighted sound level that is exceeded for noise for 10% of the sample period.

L_{A90} This is the A-weighted sound level that is exceeded for 90% of the sample period.

Noise Monitoring Location 1 and 4:

The baseline noise monitoring survey at NML 1 and 4 was carried out using a Rion NL-32 Class 1 Sound Level Analyser, in conjunction with the following:

- Outdoor kit enhanced NL-52;
- Rion WS-03SO1 Windscreen head assembly (inc WS-03051);
- Rion EC-04 2m Extension Cable (7 Pin); and
- Rion NC-74 Class 1 Acoustic Calibrator.

Noise Monitoring Location 2 and 3:

The baseline noise monitoring survey at NML 2 and 3 was carried out using a Rion -52 Class 1 Sound Level Analyser, in conjunction with the following:

- Outdoor kit enhanced NL-52;
- Rion WS-03SO1 Windscreen head assembly (inc WS-03051);
- Rion EC-04 2m Extension Cable (7 Pin); and
- Rion NC-74 Class 1 Acoustic Calibrator.

12.3.4 Noise Monitoring Results and Analysis

Recorded noise was analysed and visualised using RPS in house software. The software is written in Python and uses advanced statistical and visualisation libraries.

The approach to analysing the recorded noise data involved compiling all observations into a single dataset for the noise monitoring location using their respective time stamps before reading into the software.

The main steps the software takes are described below:

- Precipitation and average wind speed are used to remove instances of noise data where total precipitation or the average wind speed exceeded 0mm and 5m/s respectively;
- Before any further analysis, all monitoring data is visualised and dubious records were also highlighted and removed;
- Data was divided into 2 sets daytime (07:00 – 23:00hrs Monday to Sunday) and night time (23:00- 07:00hrs Monday to Sunday)
- For day and night time periods the noise monitoring parameter distributions were plotted for L_{Aeq} and L_{A90}.

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Daytime and night time frequency distribution graphs were plotted for the noise monitoring results including L_{A90} and L_{Aeq} . Complete noise monitoring results, both daytime and night-time, undertaken at NML's 1, 2, 3 and 4, are illustrated in ES Appendix 12.1 Baseline Noise Monitoring Survey Data and Analysis.

12.3.5 Statistical Analysis

Noise monitoring results were statistically analysed to determine the appropriate 'typical' L_{Aeq} and L_{A90} sound levels for 1 hour daytime durations and 15 minute night-time durations, at noise monitoring locations 1, 2, 3 and 4. The results of this statistical analysis are illustrated in Appendix 12.1 Baseline Noise Monitoring Survey Data and Analysis, which contains bar charts illustrating the complete statistical analysis data.

Table 12. 13: Typical L_{Aeq} and L_{A90} Sound Levels at all Noise Monitoring Locations

Noise Monitoring Location	Typical Daytime		Typical Night-time	
	L_{Aeq} 1 hour (dB)	L_{A90} 1 hour (dB)	L_{Aeq} 15min (dB)	L_{A90} 15min (dB)
1	56	48	44	32
2	44	37	38	36
3	47	39	43	32
4	52	42	36	33

12.4 Impact Assessment

Based on the proposed development, the potential impacts associated with noise are considered for two distinct phases:

- Demolition and Construction Phase; and
- Operational Phase.

12.4.1 Construction Phase

The proposed construction works will consist of construction activities such as ground excavation or clearing of site using heavy machinery such as dozer, excavator or backhoe loader. It is anticipated that there will be heavy construction plant associated with this proposed development, therefore all construction activities will be subject to the BS5228 noise limits as detailed in Table 12. 14.

There are occupied residential properties adjacent to the proposed development site. Construction Noise Receptors (CNR) from frequency analysis of baseline noise monitoring data contained within Appendix 12.1 Baseline Noise Monitoring Survey Data and Analysis weekday daytime ambient noise levels (L_{Aeq}) would allow the application of BS5228 noise threshold limit to the nearest noise sensitive properties during demolition and construction activities.

Typical noise levels from various construction plant are summarised in Table 12.6. The plant shown in Table 12. 14 is generally representative of the type of plant that will be in use for the construction phase of the proposed development.

Table 12. 14: Noise Levels for Construction Plant (Ref: BS5228:2009+A1:2014)

Activity/ Plant (Reference from Tables C1 & C2, Annex C, BS5228:2009+A1:2014)	Power Rating (kW)	Equipment Size, Weight (Mass), Capacity	Activity Equivalent Continuous Sound Pressure Level L_{Aeqat} 10m (dB)
Demolition: Breaker mounted on wheeled backhoe (C1-Ref 1)	59	7.4t	92
Demolition: Tracked excavator (loading dump truck) – (C1, Ref 10)	228	44t	85
Clearing Site: Dozer (C2, Ref 1)	142	20t	75
Clearing Site: Tracked excavator (C2, Ref 3)	102	22t	78
Clearing Site: Wheeled backhoe loader (C2, Ref 8)	62	8t	68
Ground Excavation: Dozer (C2, Ref 12)	142	20t	81
Ground Excavation: Tracked excavator (C2, Ref 14)	226	40t	79

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Activity/ Plant (Reference from Tables C1 & C2, Annex C, BS5228:2009+A1:2014)	Power Rating (kW)	Equipment Size, Weight (Mass), Capacity	Activity Equivalent Continuous Sound Pressure Level L_{Aeq} at 10m (dB)
Ground Excavation: Wheeled loader (C2, Ref 27)	193	-	80
Distribution of Material: Dump Truck (tipping fill) (C2, Ref 30)	306	29t	79
Distribution of Material: Dump Truck (empty) (C2, Ref 30)	306	29t	87
Rolling & Compaction: Dozer (towing roller) (C2, Ref 36)	142	20t	81

12.4.2 Predicted Impact of Construction Noise from Proposed Development

Where construction activity takes place for a development in the vicinity of residential properties, it is standard practice that the activities would operate between the hours of 07:00 and 19:00 on Monday to Fridays, between 08:00 and 13:00 on Saturdays and there will be no noisy activity on Sundays or Bank Holidays.

The precise construction strategy to be adopted will be a matter for the contractor, but it is likely that construction noise levels experienced during the construction phase will be similar to the typical construction noise levels indicated in Table 12. 14 for the various plant. Table 12. 15 below details predicted worst-case noise levels at varying distances from construction noise source, reflective of existing residential properties adjacent to the proposed development site.

In order to assess the worst-case construction noise level from the proposed development, the noise level for each of the construction activities detailed in Table 12. 14, at 10m distance has been used for the purposes of the construction noise assessment.

Table 12. 15 serves as typical examples of the noise levels predicted at varying distances from the location of the construction activity throughout the construction process. These noise level are a combination of each of the construction activity noise levels specified in Table 12. 14.

Table 12. 15: Predicted Construction Noise Levels From Different Construction Activities Due to Increased Distance

Construction Activity	Distance (meters)				
	10m	20m	40m	80m	160m
Demolition	93 (dB)	87 (dB)	81 (dB)	75 (dB)	69 (dB)
Clearing Site	80 (dB)	74 (dB)	68 (dB)	62 (dB)	56 (dB)
Ground Excavation	85 (dB)	79 (dB)	73 (dB)	67 (dB)	61 (dB)
Distribution of Materials	87 (dB)	81 (dB)	75 (dB)	69 (dB)	63 (dB)
Rolling & Compaction	81 (dB)	75 (dB)	69 (dB)	63 (dB)	57 (dB)

Noise levels were calculated at residential properties using the distance attenuation calculation:

$$L_{p2} = L_{p1} - 20 \log (D_2 / D_1)$$

L_{p2} = calculated sound pressure level in dB at a distance of D_2 meters from the noise source

L_{p1} = measured sound pressure level in dB at a distance of D_1 meters from the noise source D_2

= receiver distance (detailed in Table 12. 16)

D_1 = measurement distance (10m)

The calculation above assumes a direct line of sight from the noise source to the receiver, no barrier effect considered, which is a worst case scenario.

Figure 12.2.1 in Appendix 12.2 Construction Noise Receptors shows the CNR's in close proximity to the site boundary. Distances from each noise sensitive receptor to the proposed development were calculated from the nearest façade of each noise sensitive receptor to the site boundary.

Table 12. 16 below illustrates the distances from each CSR to the site boundary.

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Table 12. 16: Distances from Construction Noise Receptors to Proposed Development Boundary

Construction Noise Receptor ID	Residential	Receptor Sensitivity	Distance(m)
1	Yes	High	196
2	Yes	High	68
3	Yes	High	33
4	Yes	High	29
5	Yes	High	21
6	Yes	High	19
7	Yes	High	13
8	Yes	High	15
9	Yes	High	14
10	Yes	High	21
11	Yes	High	24
12	Yes	High	42
13	Yes	High	40
14	Yes	High	31
15	Yes	High	30
16	Yes	High	28
17	Yes	High	30
18	Yes	High	55
19	Yes	High	38
20	Yes	High	20
21	Yes	High	11
22	Yes	High	16
23	Yes	High	94
24	Yes	High	256
25	Yes	High	114
26	Yes	High	156
27	Yes	High	156

Using the distance attenuation calculation above and distances detailed above in Table 12. 16 construction noise predictions were calculated at CNR for each of the construction activities.

The maximum predicted construction noise levels for each activity are detailed in Table 12.17. Weekday daytime ambient noise levels (L_{Aeq}) at the nearest noise sensitive property (Noise Monitoring Location 4) averaged around 50dB. Therefore, in accordance with BS5228 a noise threshold limit Category A of 65 dB should be applied to the construction of this proposed development. BS5288 noise limits are applicable to residential properties only, not commercial or industrial.

Construction noise predictions above have been based on the plant operational throughout the full working day, are unscreened, distances are measured from the closest point on the site boundary, except for demolition, which has been measured from the point of activity.

No barrier effects have been applied. Therefore, noise predictions presented are calculated to

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be worst case. Figure 12.2.1 in Appendix 12.2 Construction Noise Receptors details the locations of the noise sensitive receptors and Table 12.17 summaries the construction noise predictions at these noise sensitive receptor locations.

Table 12.17: BS 5228 Construction Noise Limit: Predicted Construction Noise Levels at Construction Noise Receptor

Construction Noise Receptor ID	BS5228 Category A Threshold Limit	Construction Activity			
		Clearing Site	Ground Excavation	Distribution of Materials	Rolling and Compaction
1	65	54.2	61.2	63.2	55.1
2	65	63.4	70.4	72.4	64.4
3	65	69.7	76.7	78.7	70.6
4	65	70.8	77.8	79.8	71.7
5	65	73.7	80.7	82.7	74.7
6	65	74.5	81.4	83.4	75.4
7	65	77.8	84.8	86.8	78.8
8	65	76.8	83.8	85.8	77.7
9	65	77.3	84.2	86.2	78.2
10	65	73.5	80.5	82.5	74.5
11	65	72.5	79.5	81.5	73.5
12	65	67.7	74.6	76.6	68.6
13	65	68.1	75.0	77.0	69.0
14	65	70.2	77.2	79.2	71.2
15	65	70.6	77.6	79.6	71.5
16	65	71.0	78.0	80.0	72.0
17	65	70.4	77.4	79.4	71.4
18	65	65.3	72.2	74.2	66.2
19	65	68.4	75.4	77.4	69.4
20	65	73.8	80.8	82.8	74.8
21	65	79.6	86.6	88.6	80.5
22	65	75.9	82.9	84.9	76.8
23	65	60.6	67.6	69.6	61.5
24	65	51.9	58.9	60.9	52.8
25	65	58.9	65.9	67.9	59.9
26	65	56.2	63.2	65.2	57.2
27	65	56.2	63.2	65.2	57.1

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Table 12.17 illustrates that it is likely that there will be potential for construction noise impacts at the nearest CNR (residential properties) if worst-case construction activities take place without mitigation measures in place. Construction noise predictions are greater than 65 dB at the nearest CNRs

It must be noted that these construction noise predictions are an over-estimation of the likely construction noise levels that will actually be emitted from the proposed site as they assume every item of construction plant associated with the construction activity will be active simultaneously throughout the working day at the closest point from the site boundary to the construction receptor.

The construction noise assessment is deemed to be a worst case based on the following assumptions:

- Full power operation of a construction activity throughout the daytime period;
- Free field conditions are assumed and ground effects are ignored;
- Equipment is assumed to be operational at closest point to construction receptor;
- Predictions are based on the noisiest pieces of equipment operational; and
- Barrier effects have not been applied in Table 12.17.

Nevertheless, these worst-case predicted noise levels serve as a useful tool in illustrating that there is unlikely potential for significant noise impacts during the construction phase.

Construction Noise Mitigation measures likely to be put in place in order to ensure that construction noise levels are reduced as much as practicable and do not significantly impact on the nearest noise sensitive receptors are detailed in Section 12.5 below.

12.4.3 Demolition Phase

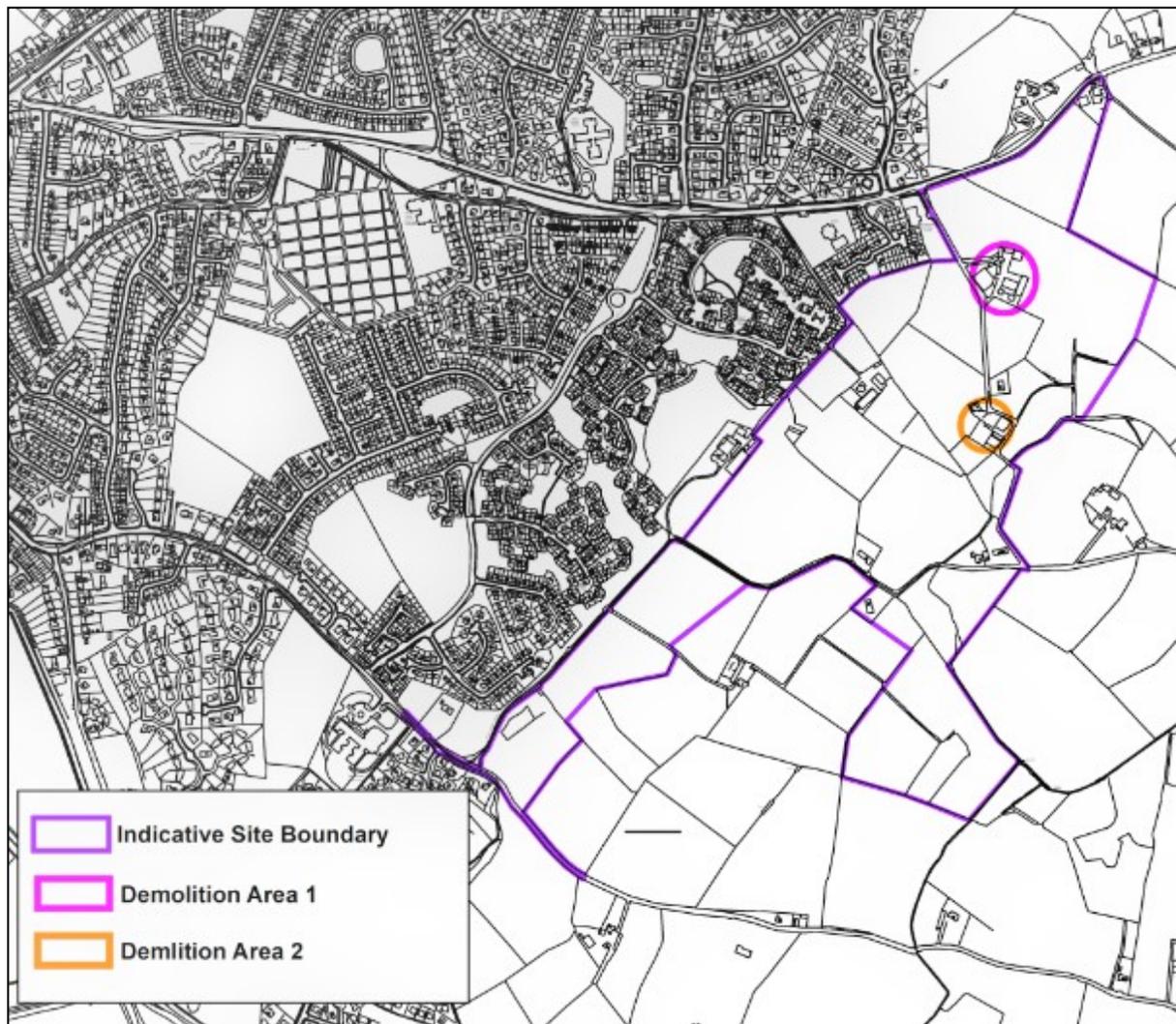
Construction of the proposed development will involve the demolition of three farm groups and an individual dwelling. All the properties belong to land owners within the zoned lands. In total five dwellings and 16 agricultural buildings will be demolished. In order to predict the noise impact associated with demolition, all buildings proposed to be demolished have been allocated into two separate areas named "Demolition Area 1" and "Demolition Area 2".

Figure 12. 3 below illustrates the proposed demolition areas.

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Figure 12. 3: Demolition Areas



Predicted noise levels associated with the demolition of the proposed buildings have been calculated using the distance attenuation calculation outlined in section 12.4.2 of this report. Distances were measured from the point of demolition activity to the nearest CNR.

Noise levels associated with demolition plant are illustrated in Table 12. 18 below.

Table 12. 18: Summary of Demolition Plant

Demolition Plant	BS5228 Ref	Sound Pressure Level at 10m dB(A)	Quantity	% on time
Breaker mounted on wheeled backhoe	C1,Ref 1	92	1	50
Tracked excavator (loading dump truck)	C1, Ref 10	85	1	50

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Based on source noise levels above in Table 12. 18, calculation of the operational noise levels associated with demolition activity have been calculated at the nearest CNRs to the demolition activity area. Predicted demolition noise levels are illustrated in Table 12. 19 below.

Table 12. 19: BS 5228 Noise Limit and Predicted Demolition Noise Levels at Construction Noise Receptors

Construction Noise Receptor ID	BS5228 Category A Threshold Limit	Demolition Noise Levels (Without Construction Barrier)	
		Demolition Area 1	Demolition Area2
1	65	61.4	57.5
2	65	60.5	56.2
3	65	65.7	58.6
4	65	67.2	60.4
5	65	72.9	63.5
6	65	68.6	63.2
7	65	65.2	63.0
8	65	64.1	63.8
9	65	63.2	63.6
10	65	61.8	62.8
11	65	60.4	61.9
12	65	58.1	60.0
13	65	55.8	57.6
14	65	54.0	55.7
15	65	53.1	54.7
16	65	52.3	53.8
17	65	51.8	53.1
18	65	51.2	52.4
19	65	50.8	51.8
20	65	50.5	51.7
21	65	50.7	51.9
22	65	50.9	52.2
23	65	50.5	52.1
24	65	51.4	53.5
25	65	52.0	54.3
26	65	54.6	57.3
27	65	60.8	65.8

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Construction noise predictions conclude that there is no exceedance of 65 dB BS 5228 noise limit at the majority of construction noise receptors. Construction noise predictions, which do not exceed the BS 5228 construction noise limit, would conclude "negligible magnitude of effect at construction noise receptors. Therefore, these construction noise receptors are likely to experience a negligible impact.

Construction noise predictions, which do exceed the BS 5228 construction noise limit between 5-10 dB, would conclude "moderate magnitude of effect" at construction noise receptors.

Construction noise predictions, which do exceed the BS 5228 construction noise limit between 10 -15 dB, would conclude "major magnitude of effect" at construction noise receptors.

12.4.4 Construction Phase Traffic Impacts

The Design Manual for Roads and Bridges (DMRB, Volume 11, Section 3, Part 7) states that it takes a 25% increase in traffic flows in order to get a 1dB(A) increase in traffic noise levels. Traffic flow movements associated with the construction phase of the proposed development will be substantially less than 25% on all roads in the study area. Worst-case traffic flow increases as a result of the proposed development will result in substantially less than a 1dB(A) increase in traffic noise levels on all significant roads in the vicinity of the proposed development.

It is generally accepted that it takes an approximate 3dB(A) increase in noise levels to be perceptible to the average person (Ref: *Planning Policy Guidance Note 24 [PPG24 - Planning & Noise]*). On this basis, the traffic noise level increases associated with the construction phase for the proposed development will be imperceptible at the nearest noise sensitive properties.

12.4.5 Operational Phase

The potential noise impact resulting from the operational phase of the proposed development has been assessed in the following ways:

- Internal noise levels in accordance with relevant standards and guidance;
- The potential plant/equipment noise impacts associated with the proposed development; and
- Impact of increased traffic as a result of the proposed development on the nearest noise sensitive receptors;

Site suitability for residential development has been considered based on measured noise levels. Internal noise levels across the site will be dependent on their proximity to traffic road noise sources and proximity to the site boundary. The following acoustic criterion has been adopted for the proposed residential and commercial development:

- Average noise levels in bedrooms should not exceed 35 dB L_{Aeq} daytime, (07:00 -

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23:00hrs) and 30 dB L_{Aeq} night time (23:00 – 07:00 hrs);

- Maximum internal noise levels in bedrooms should not regularly exceed 45 dB L_{Amax} during the night time;
- Average noise levels in external areas during the day between 50 -55 dB L_{Aeq} (criteria applied though the proposed development is not for residential dwellings);
- Operational noise limits for plant and equipment set at typical recorded L_{A90} noise levels.

Baseline daytime L_{Aeq} noise levels at the proposed development site range between 32 - 71 dB, night time L_{Aeq} noise levels range 19 to 66 dB across all NML's.

ProPG Assessment

This assessment takes cognisance of the ProPG guidance document, but considering it has been adopted in England only, this report includes it as reference in tandem with PPG24 but does not claim to strictly adhere to every detail within the ProPG guidelines.

Acoustic Design Statement - Stage 1: Initial Site Noise Risk Assessment

When noise levels recorded at the proposed development are transposed into noise risk categories on the ProPG they result in the following, as illustrated below in Table 12. 20.

Table 12. 20: ProPG Site Assessment

Noise Monitoring Location	Daytime L_{Aeq} (dB)	ProPG Initial Site Risk Assessment Categories	Night time L_{Aeq} (dB)	ProPG Initial Site Risk Assessment Categories
1	56	Low	44	Low
2	44	Negligible	38	Negligible
3	47	Negligible	43	Low
4	52	Low	36	Negligible

Negligible states:

"In this category the development is likely to be acceptable from a noise perspective, nevertheless a good acoustic design process is encouraged to improve the existing environment and/or safeguard against possible future deterioration and to protect any designated tranquil areas. A noise assessment may be requested to demonstrate no adverse impact from noise.

Application need not normally be delayed on noise grounds."

Low Risk states:

"In this category the development may be refused unless a good acoustic design process is followed and is demonstrated via a Level 1 Acoustic Design Statement which confirms how the

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adverse impacts of noise on the new development will be mitigated and minimised and that a significant adverse noise impact will not arise in the finished development. Planning conditions and other measures to control noise may be required."

Stage 2: Full Assessment – the 4 key elements

Stage 2 Acoustic Design Statement is detailed below in Table 12. 21.

Table 12. 21: Stage 2 Acoustic Design Statement

Medium Noise Risk Sites	Evidence
Element 1: Good Acoustic Design Process	Architectural drawings submitted with planning application
Element 2: Internal Noise Level Guidelines	Refer to Section 12.4.7 BS8233 noise assessment
Element 3: External Amenity Area Noise Assessment	Refer to Section 12.4.5
Element 4: Assessment of other relevant issues	Proposed size of development there is unlikely acoustic implication of other wider planning objectives

BS 8233 Assessment

BS 8233:2014 recommends internal ambient noise levels for residential properties. The guidance document states that daytime (07:00 – 23:00) internal noise levels should not exceed 35 dB and night time (23:00 – 07:00) noise levels should not exceed 30 dB.

To be reflective of a worst case scenario the BS 8233 assessment is based upon the highest recorded $L_{Aeq}(1hour)$ daytime and $L_{Aeq}(15mins)$ night time. BS 8233 assessment is shown below in Table 12. 22.

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Table 12. 22: Site Assessment BS 8233

Noise Monitoring Location	Period	Typical Noise Level L _{Aeq} dB	BS 8233 Internal ambient criteria dB	Attenuation required by building envelope R _{tra} dB
1	Day	56	35	21
	Night	44	30	14
2	Day	44	35	9
	Night	38	30	8
3	Day	47	35	12
	Night	43	30	13
4	Day	52	35	17
	Night	36	30	6

As detailed within Acoustics of Schools : A Design Guide (IoA ANC, November 2015) and BS 8223:2014 Guidance on Sound Insulation and Noise Reduction for Buildings, the airborne insulation of building elements is principally controlled by mass of the element. The main factors determining the sound insulation of a building element (e.g. wall, floor or facade) are mass, air tightness and the isolation between elements. Sound transmission in buildings occurs through direct and flanking transmission paths. Resulting sound insulation can be predicted using theory, measurement or a combination of both.

Full construction details for the proposed development have not been finalized at planning stage. However, it has been assumed that the external walls will be standard masonry construction. Therefore, internal noise levels within the proposed development will be dictated by external noise ingress via glazing.

All new windows will be double glazed units. Frames should also be sealed to ensure full insulating potential of the glazing units. Based on daytime and night time external noise levels it is recommended that double glazing providing a sound reduction of Rw+Ctr 21 dB is installed to habitable rooms throughout the proposed development.

External Amenity Areas

WHO recommend an external upper guideline value of 55dB L_{Aeq}, within areas used for amenity space. The proposed residential dwellings will be at varying distances to dominant noise sources, such as road traffic noise.

As BS 8233:2014 7.7.3.2 Design Criteria for External Noise states "it is desirable that the external

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noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments." It goes on to qualify this by stating that "it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. "In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve lowest practicable levels."

It is anticipated that the majority of the proposed dwellings will have garden spaces. External measured daytime noise levels are within the existing WHO External guideline target of 50 – 55 dB.

The proposed development also includes public open space, play areas and MUGA.

Public Open Space and Play Areas

The Town Park and Play Area is located centrally at the hub of the development. This area would be considered an area used for amenity space, therefore the WHO recommended external guideline of 55dB L_{Aeq} would apply. It is anticipated a level of 55dB L_{Aeq} can be achieved within this amenity space as it is located away from the dominant noise source, which will be road traffic noise. This amenity space will also be shielded from the dominant noise source by the dwelling buildings, which will act as a noise barrier between the Town Park and the carriageway. The NML relevant to the proposed Town Park area of the development is NML 2, existing L_{Aeq} levels are measuring around 44(dB) L_{Aeq} Daytime and 38(dB) L_{Aeq} Night-time..

The proposed Multi Use Games Area (MUGA) is shown below in Figure 12. 4.

Figure 12. 4: MUGA Location



Figure 12. 5 below illustrates the proposed Town Park and Play Area along the eastern boundary of the development.

Figure 12. 5: Public Open Space



Plant and Equipment

At this outline planning application stage the precise details and specifications of any proposed commercial units for the mixed use High Street are unknown. As this information is unknown, noise emissions from external mechanical plant and equipment cannot be accurately predicted at nearby and proposed sensitive receptors. However BS 4142 noise limits, both daytime and night time, can be set for any proposed development site to ensure that future occupants of the proposed development are not adversely affected by operational plant and equipment noise.

At detailed design stage mitigation measures, if required, may need to be incorporated into the design of external mechanical plant and equipment. Mitigation measures can include a lower noise emission model such as a night mode operational setting, or a suitable acoustic enclosure.

The NML relevant to the proposed commercial/retail area of the development is NML 2. Typical $LA_{90, 1 \text{ hour}}$ measurements from the daytime (07:00-23:00) and night time $LA_{90, 15 \text{ minute}}$ (23:00-07:00) periods at noise monitoring location 2 are detailed in Table 12.13.

Table 12.23 summarises the daytime and night time noise threshold limits suggested for plant/equipment noise from proposed external plant and equipment to be installed.

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Table 12. 23: Derived Noise Thresholds for Plant/Equipment

Noise Monitoring Location	Typical Sound Levels (LA90) dB	Penalty for Tonality dB(A)	Derived Noise Threshold Limit dB(A)
2	37.0 (daytime)	-6	31.0
	36.0 (night time)	-6	30.0

The limits have been derived from the guidance for the determination of likelihood of complaints as outlined in BS4142:2014.

Section 11 of BS4142:2014 states that a specific plant/equipment noise source of +5dB above background noise levels (i.e. LA90) is likely to be an indication of an adverse impact, depending on the context. On this basis, the appropriate acceptable noise threshold level for specific plant/equipment noise has been set at the same level as the background sound level at the nearest receptors to the High Street. The noise threshold limit included in Table 12. 23 has been derived for night time and daytime periods.

Tonal characteristics associated with the specific plant/equipment noise have been accounted for by assuming the maximum 6dB penalty from the 0-6dB range discussed in Section 9.3.3 of BS4142:2014. The selection and design of the mechanical plant will be used to ensure that the noise limits presented in Table 12. 23 are complied with.

MUGA

Sport England Design Guidance Note for Artificial Grass Pitch (AGP) Acoustics – Planning Implications New Guidance for 2015 [Sport England Guidance]. The information in this document is that the typical sound level of activities on such a pitch is 58dB LAeq,1hr as a distance of 10 metres from the edge (side-line) of the pitch.

The separation distance between the boundary to the MUGA and nearest proposed house is 25 m and apartment is 42m.

Using distance attenuation calculation, based on distance of proposed nearest residential properties as summarised in Table 12.24, assuming operational noise levels as MUGA 58dB at 10m, predicted operational MUGA noise levels are calculated. Approximately 28 dB attenuation is predicted to the nearest house at 25m, and 32 dB attenuation is predicted to the nearest apartment.

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Table 12.24: Predicted External Noise Level at Proposed Nearest Residential Properties from MUGA

Proposed Development	Distance (m)	Attenuation (dB)	Predicted External Noise Level
Dwelling	25	8	50
Apartment	42	12.5	45.5

External predicted noise levels are less than WHO external noise guideline of 50-55dB.

Road Traffic Noise Assessment

A road traffic noise impact assessment can be undertaken once the layout of the proposed development has been finalised. At this outline planning stage the layouts of the dwellings and gardens are unknown.

The Design Manual for Roads and Bridges (DMRB) states that it takes a 25% increase in traffic flows in order to get a 1dB(A) increase in traffic noise levels. It is generally accepted that it takes an approximate 3dB(A) increase in noise levels to be perceptible to the average person (Ref: Planning Policy Guidance Note 24 [PPG24 - Planning & Noise]).

12.5 Mitigation

12.5.1 Construction Phase

As outlined in Section 12.4, there is potential for short-term noise impacts at the nearest noise sensitive properties if worst-case construction noise levels occur. Table 12.5 outlines predicted noise levels at varying distances from the construction noise source. Table 12. 24 outlines predicted construction noise levels at CNR. These tables of predicted construction noise levels indicate that there is potential for noise impacts at the nearest CNR if suitable mitigation measures are not in place. It must be noted that these worst-case predicted noise levels are very much an overestimation of the likely construction phase noise levels as they assume that all plant will be active simultaneously. In addition to this, the noisiest activities associated with the construction phase will be limited as detailed above. Nevertheless there is a need for appropriate mitigation measures to be in place during the construction phase.

Construction works along the site boundary will be limited in duration; plant and machinery will not be fully operational during the working day; barrier will ensure that the construction noise limit of 65 dB is adhered to.

A construction barrier will be located around the proposed development which will provide at least 10 dB attenuation to predicted construction noise levels at all receptor locations. Attenuated predicted construction noise levels are shown below in Table 12.23 which have been reduced by 10 dB to account for barrier effects of proposed construction barrier.

Table 12.23: Predicted Attenuated Construction Noise Levels at Construction Noise Receptors

Construction Noise Receptor ID	BS5228 Category A Threshold Limit	Construction Activity			
		Clearing Site	Ground Excavation	Distribution of Materials	Rolling and Compaction
1	65	44.2	51.2	53.2	45.1
2	65	53.4	60.4	62.4	54.4
3	65	59.7	66.7	68.7	60.6
4	65	60.8	67.8	69.8	61.7
5	65	63.7	70.7	72.7	64.7
6	65	64.5	71.4	73.4	65.4
7	65	67.8	74.8	76.8	68.8

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Construction Noise Receptor ID	BS5228 Category A Threshold Limit	Construction Activity			
		Clearing Site	Ground Excavation	Distribution of Materials	Rolling and Compaction
8	65	66.8	73.8	75.8	67.7
9	65	67.3	74.2	76.2	68.2
10	65	63.5	70.5	72.5	64.5
11	65	62.5	69.5	71.5	63.5
12	65	57.7	64.6	66.6	58.6
13	65	58.1	65.0	67.0	59.0
14	65	60.2	67.2	69.2	61.2
15	65	60.6	67.6	69.6	61.5
16	65	61.0	68.0	70.0	62.0
17	65	60.4	67.4	69.4	61.4
18	65	55.3	62.2	64.2	56.2
19	65	58.4	65.4	67.4	59.4
20	65	63.8	70.8	72.8	64.8
21	65	69.6	76.6	78.6	70.5
22	65	65.9	72.9	74.9	66.8
23	65	50.6	57.6	59.6	51.5
24	65	41.9	48.9	50.9	42.8
25	65	48.9	55.9	57.9	49.9
26	65	46.2	53.2	55.2	47.2
27	65	46.2	53.2	55.2	47.1

12.5.2 Demolition Phase

As outlined in Table 12.24 there will be no noise impact associated with the demolition of buildings for the proposed development subject to the use of the appropriate mitigation measures. In accordance with BS5228 a noise threshold limit Category A of 65 dB will be adhered to throughout the demolition phase if appropriate mitigation measures are in place.

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Table 12.24: Predicted Attenuated Demolition Noise Levels at Construction Noise Receptors

Construction Noise Receptor ID	BS5228 Category A Threshold Limit	Demolition Noise Levels (With Construction Barrier)	
		Demolition Area1	Demolition Area2
1	65	51.4	47.5
2	65	50.5	46.2
3	65	55.7	48.6
4	65	57.2	50.4
5	65	62.9	53.5
6	65	58.6	53.2
7	65	55.2	53.0
8	65	54.1	53.8
9	65	53.2	53.6
10	65	51.8	52.8
11	65	50.4	51.9
12	65	48.1	50.0
13	65	45.8	47.6
14	65	44.0	45.7
15	65	43.1	44.7
16	65	42.3	43.8
17	65	41.8	43.1
18	65	41.2	42.4
19	65	40.8	41.8
20	65	40.5	41.7
21	65	40.7	41.9
22	65	40.9	42.2
23	65	40.5	42.1
24	65	41.4	43.5

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Construction Noise Receptor ID	BS5228 Category A Threshold Limit	Demolition Noise Levels (With Construction Barrier)	
		Demolition Area1	Demolition Area2
25	65	42.0	44.3
26	65	44.6	47.3
27	65	50.8	55.8

The worst-case predicted noise levels for the various stages of the construction and demolition activities are included in Table 12.17 and Table 12.19.

The proposed construction works will occur in close proximity to construction noise receptors for a limited number of days. Therefore, impact will be temporary and not significant.

No permanent residual noise and vibration impacts are predicted as a during construction of the Proposed Development. However, some short term residual impacts during the construction stage of the Proposed Development are predicted.

These predicted construction noise levels indicate that the nearest CNRs to the proposed mixed use development will experience noise levels that are below or slightly above the applicable noise threshold limit as designated by the ABC Method in BS 5228:2009+A1:2014.

While predicted noise levels from the demolition and construction activities are predicted best practice measures will be employed to ensure that construction and demolition phase noise levels are reduced to the lowest possible levels.

A range of measures should be taken to ensure that the quietest machinery is utilised such as to be sensitive to the residents at the nearest properties.

British Standard BS5228:2009+A1:2014 – Noise and vibration control on construction and open sites outlines a range of measures that can be used to reduce the impact of construction phase noise on the nearest noise sensitive receptors. These measures should be applied by the contractor where appropriate during the construction phase of the proposed mixed use development.

A Construction Environmental Management Plan (CEMP) will be completed prior to commencement of construction works.

Proposed construction working hours will be:

- Monday to Friday – 07:00 to 19:00 hrs; and
- Saturday– 08:00 to 13.30 hrs.

Working outside these hours may occasionally be necessary for operational or safety reasons.

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Controls to be implemented during demolition activity include:

- Programming of works to make use of existing barriers to noise;
- Retaining outer walls for as long as possible before demolition;
- Switching off plant when not in use;
- Use of temporary acoustic barriers to minimise noise breakout; and
- Using low noise impact methods of bursting and splitting rather percussive breaking during demolition.

Examples of some of the best practice measures included in BS5228 are listed below:

- Ensuring that mechanical plant and equipment used for the purpose of the works are fitted with effective exhaust silencers and are maintained in good working order;
- All plant items to be properly maintained and operated according to manufacturers' recommendations in such a manner as to avoid causing excessive noise.
- Careful selection of quiet plant and machinery to undertake the required work where available, to minimise construction noise at the nearest noise sensitive properties;
- All major compressors should be 'sound reduced' models fitted with properly lined and sealed acoustic covers which should be kept closed whenever the machines are in use;
- Any ancillary pneumatic percussive tools should be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Machines in intermittent use should be shut down in the intervening periods between work;
- Ancillary plant such as generators, compressors and pumps should be placed behind existing physical barriers, and the direction of noise emissions from plant including exhausts or engines should be placed away from sensitive locations, in order to cause minimum noise disturbance;
- Handling of all materials should take place in a manner which minimises noise emissions;
- Audible warning systems should be switched to the minimum setting required by the Health & Safety Executive;
- Background noise monitoring will be regularly undertaken during the construction process to ensure noise limits are adhered to. Excessive noise and vibration on site not only represents a major hazard to site workers but it can also annoy neighbours and in some cases disturb adjacent wildlife;
- Best practice will therefore be implemented in order to minimise noise and vibration and comply with the contents and recommendations of the BS 5228 "Code of Practice for Noise Control on Construction and Open sites".

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- In order to minimise the likelihood of complaints, Ards and North Down Borough Council and affected residents should be kept informed of the works to be carried out and of any proposals for work outside normal hours; and
 - All complaints will be recorded by the appointed contractor. The contractor will investigate the circumstances and ensure the necessary corrective measures are taken.

In order to minimise the likelihood of complaints, Ards & North Down Borough Council and affected residents will be kept informed of the works to be carried out and of any proposals for work outside normal hours. Construction noise monitoring will be undertaken throughout the construction duration to ensure compliance with the construction noise threshold limits.

Construction Traffic

No construction traffic noise impacts are anticipated from the construction of the Proposed Development. Therefore, no specific construction traffic noise mitigations are proposed during the construction of the Proposed Development.

Construction Vibration

No construction vibration impacts are anticipated from the construction of the Proposed Development. Therefore, no specific vibration mitigations are proposed during the construction of the Proposed Development.

12.5.3 Operational Phase

Plant and Equipment

Plant and equipment is not known at this planning stage. It is likely that plant and equipment will be designed to service the retail and commercial units. Design target noise levels have been detailed based on the existing measured noise levels at the most representative noise monitoring locations. In addition to design of target noise levels additional mitigation measures can be considered by the design team at detailed design stage including:

- Where possible, placing fixed plant installations internally;
- Selection of plant and equipment with low noise emissions;
- Use of enclosures, acoustic barriers, and screens;
- Selection of appropriately sized attenuators where applicable; and
- Operation of plant installations at reduced capacity during night time periods.

It is considered that the operational noise effect should be negligible and not significant by incorporating mitigations and design noise target noise levels at detailed design stage.

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Building Design and Construction

Site Suitability Façade Design

Double glazing will be installed throughout the residential development. Double glazing has been referenced to provide sound reduction of 30-33 dB when windows are closed. In accordance with PPG 24 an openable window provides attenuation of 10 – 15 dB.

The typical recorded L_{Aeq} noise levels from NML1 – NML4 for both daytime and night time have been summarised in Table 12. 13. The sound reduction R_w performance of the glazing to the proposed residential development is summarised in Table 12.25.

Table 12. 25: Sound Performance (R_w) at Residential Properties (dB)

Location	Period	Typical Recorded L_{Aeq} Noise Level	BS 8233 and WHO Internal ambient criteria dB	R_w
1	Daytime	56	35	21
	Night time	44	30	14
2	Daytime	44	35	9
	Night time	38	30	8
3	Daytime	47	35	12
	Night time	43	30	13
4	Daytime	52	35	17
	Night time	36	30	6

Double glazing will be installed throughout the residential development. Double glazing has been referenced to provide sound reduction of 30-33 dB when windows are closed. In accordance with PPG 24 an openable window provides attenuation of 10 – 15 dB.

There are numerous window specifications that can easily meet the R_w requirements specified in the paragraph above. For example, Pilkington are a major worldwide supplier of glazing units and offer numerous glazing specifications that achieve the R_w noise reduction values for bedrooms and living areas of the proposed residential development as outlined above.

Double glazing will be installed throughout the residential development. Double glazing has been referenced to provide sound reduction of 30-33 dB when windows are closed. In accordance with PPG 24 an openable window provides attenuation of 10 – 15 dB.

At final design stage/reserved matters, when internal layouts are available, a detailed design assessment will be undertaken and table detailing ventilation and glazing will be forwarded to Environmental Health Department.

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Ventilation

When windows are open the sound reduction of the window will reduce to 10-15 dB Rw. To preserve the internal noise design criteria within all habitable rooms within the proposed development an alternative form of ventilation is proposed. Future occupants should be provided with a supply of fresh air in habitable rooms without having to open windows. However, windows to habitable rooms throughout the proposed residential development will be fitted with acoustic trickle vents as alternative ventilation option. As is standard, it will be necessary to provide trickle ventilation in order to achieve suitable background ventilation rates with windows closed. It is necessary to consider such ventilation as part of any BS 8233 assessment: "any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment"

Non-habitable rooms (such as bathrooms) have no acoustic requirements, so no specific acoustic ventilation is necessary to such rooms. Windows should not be sealed, but openable for times when purge ventilation is required (purging of fumes from burnt food when cooking or removal of fumes when painting).

The final ventilation system must comply with Building Control Regulations (NI) 2012 Technical Booklet K Ventilation.

With the above glazing and alternative ventilation in place, it has been demonstrated to achieve the internal noise levels within habitable rooms in compliance with BS 8233 and WHO daytime and night time concluding "negligible magnitude of impact".

MUGA Sports England Design Guidance Note Mitigations

The proposed MUGA will be subject to operational times during daytime only.

Sport England Design Guidance Note provides ball impact sound mitigations that can be incorporated into pitch design including securely clamped panels to fencing to avoid vibrations, use of soft vinyl signage, managing spectators to avoid congregating adjacent to residential properties and avoiding unreasonable behavior.

Suggested mitigations include:

- The sound balls hitting the fence and other surroundings creates a sharp, loud striking noise often more irritating than the noise from pitch users. Padding and carefully selected fencing can mitigate this;
- Clamp panels to prevent noises from vibration;
- Metal advertising signs should be replaced with signs of a softer material;
- Build substitute shelters in recesses to reduce possibility of ball impact;
- Locate access to pitch away from housing as people assemble in these areas;
- Management plan designed to respond to users creating irrational amounts of noise;

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and

- Allow only authorised groups to use facility when possible.

None of the proposed facilities i.e. MUGA or play area will be operation during night time hours (11pm – 7am) therefore, there is no night time noise impact associated with these. Artificial lighting is not proposed to service the MUGA.

Neither the MUGA nor the play area will be available for commercial hire.

12.5.4 Operational Phase Mitigation

Operational Noise

No operational noise impacts resulting from the operation of the Proposed Development on existing residential receptors are anticipated. Therefore, no specific mitigation measures are proposed during the Project operation.

Operational Vibration

No operational vibration impacts resulting from the operation of the Proposed Development on existing residential receptors are anticipated. Therefore, no specific mitigation measures are proposed during the Project operation.

12.6 Cumulative

A summary of other Proposed Development schemes in the area is presented in Chapter 4.

The inter-project cumulative effects have been assessed based on the current information available and a number of assumptions. There is the potential for cumulative and in-combination effects during construction, should there be an overlap between different construction activities in the wider area.

Any such cumulative impacts would reduce with distance away from a neighbouring site so that beyond 1km the cumulative impacts will be negligible regardless of the performance of the construction phase mitigation that will be implemented for a Proposed Development.

As identified earlier in this Chapter, the Proposed Development will result in negligible effects on the ambient noise climate during the operational phase for all receptor locations. Given that other Proposed Developments are at greater distances than the receptors included within this assessment, it can be concluded that cumulative impacts will not be significant.

Where cumulative projects have been constructed there are no cumulative construction noise impacts associated with construction of Proposed Development. This would result in negligible effect and significant negligible impact.

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12.7 Summary of Effects

12.7.1 Construction Phase

In order to identify the potential construction noise and vibration impacts upon construction noise receptors 320m either side of the Proposed Development defined as noise and vibration study area. A construction noise assessment has been performed according to the method and guidance provided in BS 5228.

Construction noise levels have been predicted from proposed construction activities associated with proposed development

Construction vibration is not proposed during construction of Proposed Development.

Pre-mitigation, the predicted construction noise impacts are anticipated to result in effects ranging from negligible to major significance at all construction noise receptors.

Mitigation in the form of construction barrier, restrictions on timing of activities and best practicable means have been recommended such that the significance of effects are as low as possible. In addition, it has been recommended that residents are informed when activities that may produce high noise for a short period of time are to be undertaken. Elevated levels can be tolerated if prior notification and explanation is given.

12.7.2 Operational Phase

No residual impacts or residual significant effects are predicted for the operational stage of the Proposed Development.

12.7.3 Transboundary

The Proposed Development is not located close to any international boundaries and there will be no transboundary effects in relation to noise and vibration.

Chapter 13: Landscape and Visual Impact Assessment

13.1 Introduction

This Landscape and Visual Impact Assessment (LVIA) has been prepared by Park Hood Chartered Landscape Architects on behalf of Pragma Planning & Development Consultants Ltd. and Fraser Homes Ltd.

Statement of Expertise

Park Hood is a Chartered Member of the Landscape Institute (UK Registration Number NI 054443) with extensive experience in preparation of Landscape and Visual Appraisals (LVA), Landscape and Visual Impact Assessments (LVIA), Townscape Assessments and Site Capacity Studies for large scale residential and mixed-use developments throughout Ireland and the UK as stand-alone reports or part of Environmental Statements.

The author is Andrew Bunbury who is a fully qualified Landscape Architect and Chartered Member of the Landscape Institute (CMLI) UK with over 20 years' consultancy experience in the landscape profession including LVIA processes related to residential developments of this nature and scale. He is based in Park Hood's Belfast office of where there are 25 members of staff including a further twelve other Chartered Landscape Architects.

All work is undertaken in compliance with the *Landscape Institute's Code of Standards of Conduct and Practice for Landscape Professionals*.

Proposed Development Summary

The LVIA relates to a proposed residential development across the NS19 Housing Zoning and NS43 Open Space Zoning (as per Ards and Down Area Plan 2015) which total 41.05 hectares / 101.5 acres of land to the west of Newtownards in Co. Down. **See Figure 13.1 - Site Location Plan (in Appendix 13A)**

The outline planning application is for development of between 675 no. residential units (across 33.73 hectares / 83.34 acres), public open space (across 7.32 hectares / 18.1 acres) with children's play areas, local distributor road, community facilities, pedestrian and cycle networks, associated landscaping and site access works ("the Development").

A full description is contained within Chapter 2 (Pragma Planning & Development Consultants Ltd.)

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13.2 Relevant Guidance, References and Legislation

Data Sources and Guidance Documents

The overall approach and methodology undertaken in this LVIA are based on techniques and guidance in the *Guidelines for Landscape and Visual Impact Assessment (3rd Edition 2013)* by *The Landscape Institute and the Institute of Environmental Management & Assessment (GLVIA)*.

References and Legislation

This assessment has been carried out in accordance with the current planning policy & guidance in Northern Ireland and planning policies which cover the Study Area. Published guidance documents which contain relevant statutory planning designations relevant to the Study Area are listed below:-

- *Planning (EIA) Regulations (NI) 2015;*
- *Strategic Planning Policy Statement for Northern Ireland - Planning for Sustainable Development (SPPS); DoE 2015;*
- *Planning Policy Statements 3, 7 and 8; Planning & Environmental Policy Group DoE Planning NI;*
- *Ards and Down Area Plan; Planning NI (2015).*
- *Improving the Quality of Housing Developments by CEF, NIHE, Roads Service (DOE) and Planning Service (DOE) (2000);*
- *Living Places – An Urban Stewardship and Design Guide for Northern Ireland; DOE 2014; and*
- *Creating Places – Achieving quality in residential environments; Planning Service (DOE) & Roads Service (DOE) (2000);*

Other resources and references include the following:-

- *Northern Ireland Landscape Character Assessment; Northern Ireland Environmental Agency (2000);*
- *Northern Ireland Regional Landscape Character Assessment (NIRLCA) prepared for the Northern Ireland Environment Agency by LUC in association with Mullin Design Associates and Julie Martin Associates (2015);*
- *NIEA “Map Viewer” by Northern Ireland Environmental Agency to identify relevant “Protected Areas” and “Built Heritage”;*

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- <https://www.spatialni.gov.uk/>;
- *Northern Ireland Local Government District Tourism Statistics 2016; Northern Ireland Statistics and Research Agency (2017);*
- <https://www.nisra.gov.uk/>;
- *WalkNI; <http://www.walkni.com>*
- *Discover Northern Ireland: <http://www.discovernorthernireland.com>; and*
- *Sustrans Map - the National Cycle Network - www.sustrans.org.uk/bike-routes-map*

All feasible and reasonable attempts have been made to ensure that the information provided by a range of public sector institutions and presented in this LVIA is accurate and up-to-date.

13.3 Method of Assessment

Structure of Assessment

The LVIA focuses on the key landscape and visual issues associated with the development with particular reference to the following:-

- The effect of the development upon the landscape resource;
- The effect of the development on the perception of the landscape; and
- The effects arising from the development on visual amenity.

Landscape and Visual Assessment Definitions and Distinctions

For the purpose of this assessment, this report adopts the definition of landscape presented in the European Landscape Convention and as such the term 'landscape' refers equally to areas of rural countryside and urban – built up – areas (typically historically referred to as 'townscape'). The definition of landscape is "An area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors".¹

Landscape and Visual Impact Assessment (LVIA) is often integral to effective planning decisions since it helps identify the effects of new developments on views and on the landscape itself. Landscape and Visual effects can be quite different and are assessed separately although the process is similar and effects ultimately arise as a result of combined impacts upon the landscape and visual amenity of a proposed Development.

¹ Council of Europe (2000) European Landscape Convention Florence; 20.10.2000

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Developments can have significant visual effects but no impact on landscape character and some can be vice versa.

Landscape Effects are the effects on landscape (or townscape) as a resource and defined as follows:

“An assessment of landscape effects deals with the effects of change and development on landscape as a resource. The concern ... is with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character. ... The area of landscape that should be covered in assessing landscape effects should include the site itself and the full extent of the wider landscape around it which the proposed development may influence in a significant manner.” (GLVIA 3 paragraphs 5.1 and 5.2)

Visual Effects are the effects on Views and Visual Amenity and summarised as follows:-

“...establish the area in which the development may be visible, the different groups of people who may experience views of the development, the places where they will be affected and the nature of the views and visual amenity at those points.” (GLVIA 3 paragraph 3.13)

Landscape and Visual Assessment Process

The LVIA Methodology can be summarised as undertaking the following key tasks:-

- Site Visits undertaken between August 2018 and April 2021;
- Assessing the Baseline Landscape Setting and Conditions;
- Summary of key components of the proposed Development based on site layouts, plans and elevations prepared by ACA Architects, RPS and other members of the design team;
- Review of Mitigation and Enhancement Measures;
- Assessment of Landscape Effects, including the effect of mitigation proposals;
- Assessment of Visual Effects, including the effect of mitigation proposals; and
- Summary Statement and Conclusions.

Baseline Landscape Assessment Methodology

The baseline landscape assessment identifies and records the character of the lands and the key elements, features and aesthetic or perceptual factors which contribute to it. The studies extend to include to the wider context into which the proposed development will be introduced. It involves a desk-top analysis and review of material including: -

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- National and Regional Landscape Character or local Landscape Character Assessments;
- Existing National, Regional or Local Designations and relevant Planning Policy;
- Current and historical Ordnance Survey (OSNI) Maps;
- Aerial Photographs via Bing, Google, OSNI and Spatial NI; and
- Relevant environment / ecology, cultural heritage, historical and archaeology evidence.

Landscape Character Assessment

As part of the Baseline Assessment, the combination of desk-top analysis and site survey allows judgment to be made on the key elements that contribute to the landscape character and its wider condition (positive, neutral or negative) and wider value and sensitivity.

Landscape value, quality and sensitivity is affected by factors including: (i) whether the resource is common or rare; (ii) whether it is considered to be of local, regional, national or global importance; (iii) whether there are any statutory or regulatory limitations / requirements relating to the resource; (iv) the quality of the resource; (v) the maturity of the resource, and (vi) the ability of the resource to accommodate changes. **See Table 13.1**

Table 13.1 Determination of Landscape Value and Sensitivity

Terminology	Definition	Summary
Highest Value Landscape	Nationally or regionally important landscape with high quality, highly valued rare or unusual features recognised by designation such as AONB's, Areas of Scenic Value or World Heritage Sites. Distinct landscapes that exhibit a strong structure and character with valued features that combine to give the experience of scenic quality, tranquillity, rarity and harmony. Negligible pedestrian and traffic conflict.	Very vulnerable to change. <i>High Sensitivity</i>

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Very Attractive Landscape	Locally or regionally designated landscapes – including Local Landscape Policy Areas - or areas where local evidence indicated as being more valued than the surrounding area.	Some ability to absorb change in some situations without having significant effects. <i>Medium Sensitivity</i>
Medium Landscape	“Everyday” or community / undesignated landscapes which may be appreciated by the local community but has no or little wider recognition of its value.	Able to accommodate change without significant effects. <i>Low Sensitivity</i>
Poor Landscape	Low importance and degraded landscapes with few redeeming features. No evidence of being valued by the community	Damaged landscapes very capable of accommodating change. <i>Very Low Sensitivity</i>

The objective of this assessment is to evaluate the likely significance of landscape character and visual amenity effects to the Development Land and study area to assist the determining authority in considering the acceptability of this proposal. It is based on the interpretation of the physical and aesthetic characteristics following criteria and terminology described in the tables below. These are partially drawn from Principles and Overview of Processes (Chapter 3) within GLVIA. Mitigation measures proposed to prevent/avoid, reduce and, where possible, offset or remedy any significant adverse landscape or visual effects are described.

This report considers how the proposed development would impact on existing landscape elements and resources which are normally associated with the direct effects on the Development Land itself. The indirect impacts of the proposed development on the wider landscape are assessed with reference to landscape types or character areas.

This is affected by factors including: (i) the physical extent and nature of the key elements that make up the proposal; (ii) the landscape context of these effects and (iii) the time-scale of impact, such as whether it is temporary (short, medium or long term), permanent with reversible potentials, or irreversibly permanent. **See Table 13.2**

Table 13.2 Magnitude Criteria for Landscape Character Effects

Terminology	Definition
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Substantial	Total loss or major alteration to key elements / features / characteristics of the baseline (i.e., pre-development) landscape and /or introduction of elements considered to be totally dominant when set within the attributes of the receiving landscape.
Moderate	Partial loss or alteration to one or more key elements / features / characteristics of the baseline (i.e., pre-development) landscape or view and /or introduction of elements that may be prominent but may not necessarily be considered to be substantially uncharacteristic when set within the attributes of the receiving landscape.
Slight	Minor loss or alteration to one or more key elements / features / characteristics of the baseline (i.e., pre-development) landscape or view and /or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape.
Negligible	Very minor loss or alteration to one or more key elements / features / characteristics of the baseline (i.e., pre-development) landscape or view and /or introduction of elements that are not uncharacteristic with the surrounding landscape - approximating the 'no change' situation.

In those instances where there would be no change to the landscape, the magnitude is recorded as 'zero' and the level of effect as 'no change'.

Visual Amenity Assessment

Visual Effects are concerned wholly with the effect of the development on views, along with the general visual amenity and are defined by the Landscape Institute in GLVIA, Paragraph 6.1 which states: -

"An assessment of visual effects deals with the effects of change and development on views available to people and their visual amenity. The concern ... is with assessing how the surroundings of individuals or groups of people may be specifically affected by changes in the context and character of views."

The baseline studies establish the area from which the proposed development may potentially be visible and the different groups of people ("visual receptors") who may experience views or changes to view context.

Viewpoints are generally identified in locations that are publicly accessible, such as roads, public realm / domain areas, footpaths or publicly accessible heritage sites. Selection is also based on a determination of the extent of visibility of the proposed

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development site from locations where there may be significant numbers of visual receptors who will see the proposed development e.g., tourist sites or residential areas. Viewpoints are chosen to be representative, specific or illustrative and cover as much of the study area as reasonable or necessary and address all areas where there may be changes in terms of views or visual amenity.

Viewer sensitivity is based on the nature of the visual receptor (resident, tourist, commuter etc.) and the visual quality or value attached to a particular view. **See Table 13.3**

Table 13.3 Viewer Sensitivity and Types

Terminology	Definition	Summary
High	Notable views of heritage assets, quality, valued or scenic landscapes. Views that may be designated or feature in guidebooks, scenic tours, associated with culture, literature and art or an important contributor to experience.	People engaged in outdoor activity whose interest is likely to be focused on the landscape or particular views. e.g., hill-walkers, tourists, scenic tours, users of public rights of way. Residents / Communities living within close proximity of the proposal.
Medium	Ordinary views where the reason for visual receptor to be in the area and does not involve or depend upon an appreciation of the views of the landscape.	Outdoor activity with focus on recreation, sports or water-based activities such as golf, mountain biking, or country sports. Travellers on road and rail.
Low	Areas that may be viewed by the majority as incidental landscapes where the focus of the viewer is on their work or activity and the setting is not important to the visual amenity or quality of working life.	Landowners for proposal. Workers with employment related to construction and management / maintenance activity and likely to have a low interest or appreciation of the view.

The visual effects deriving from the proposed development are based on the combined judgement of the anticipated change in nature, visual amenity and duration of the

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particular view (magnitude) and the nature of the visual receptor (sensitivity). **See Table**

13.4

Table 13.4 Visual Effects Criteria

Terminology	Definition
Severe	A major change or obstruction of a view that may be directly visible, appearing as the dominant and contrasting feature appearing in the foreground
Substantial	A major change or obstruction of a view that may be directly visible, appearing as a prominent and contrasting feature and/or appearing in the foreground / middle ground.
Moderate	A moderate change or partial view of a new element within the view that may be readily noticeable, directly or obliquely visible including glimpsed, partly screened or intermittent views, appearing as a noticeable feature in the middle ground.
Slight	A small level of change, affecting a small part of the view that may be obliquely viewed or partly screened and/or appearing in the background landscape. May include moving views at speed. The proposal forms a minor component in the wider view which might be missed by the casual viewer / observer.
Negligible	The proposal is barely discernible or may be at such a distance that it is very difficult to perceive equating to a no-change situation.

The nature of visual effects are based on a number of factors including:-

- Scale of change;
- Distance from proposed development site;
- Contrast in terms of mass, colour, form and texture deriving from new feature(s);
- Extent of intervening vegetation (and seasonality if deciduous) or buildings and topography;
- Speed of passing visual receptor (and how long view is experienced);
- Angle and elevation of view e.g., oblique, direct, perpendicular;
- Nature of backdrop or skyline; and
- Duration of change or effect.

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Where mitigation measures are proposed or relevant, these are described as part of any judgement.

Nature of Landscape and Visual Effects

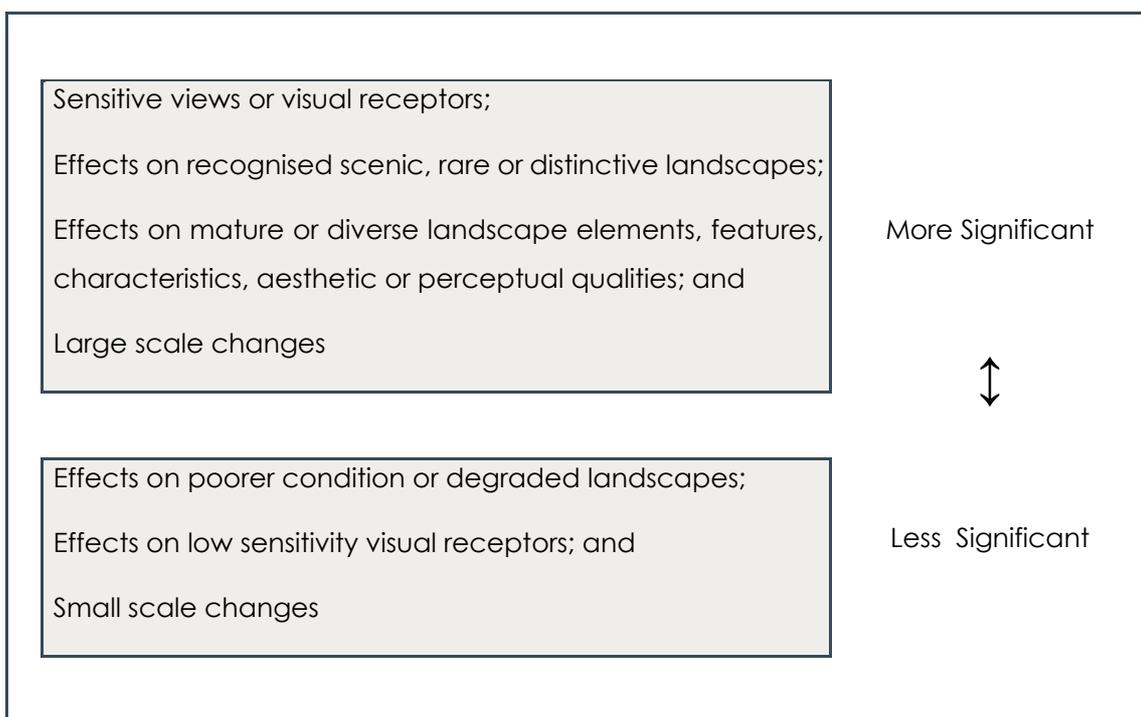
The assessment process aims to be objective and quantify effects as far as possible. However, landscape and visual assessment has aspects of it that can be considered subjective. Magnitude of change to a view can be factually defined but any subsequent objective assessment should be based on professional training, experience, observation, evidence and informed opinion. **See Table 13.5**

Table 13.5 Nature of Landscape and Visual Effects

Terminology	Definition
Positive Effect	A change that improves the quality of the landscape character and fits very well with the existing setting.
Neutral	A change which does not affect the scale, landform or pattern of the landscape and maintains existing quality.
Adverse Effect	A change which reduces the quality of the landscape and cannot be fully mitigated.

Significance Criteria and Determination

Table 13.6 Summary Scale of Significance



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This assessment bases "Significance" of effects on the following definitions:-

- "Significant" in the Oxford Dictionary 2021 is defined as "*Sufficiently great or important to be worthy of attention; noteworthy.*"; and
- "Significance" in the GLVIA guidelines 2013 is defined as "*A measure of the importance or gravity of the environmental effect, defined by significance criteria specific to the environmental topic.*"

Final judgment is made about which landscape effects are significant. Significance of an effect is determined by the combination of sensitivity of the affected receptor(s) and the predicted magnitude of change which combine to form a level of effect. **See Table 13.6**

Significance of visual effects is not absolute and can only be defined in relation to each development and its specific location. Usually an effect is considered 'significant' if the level of effect is 'moderate/substantial' or 'substantial'. The significance of landscape and visual effects is determined by cross-referencing sensitivity of landscape or view with the magnitude of change. **See Table 13.6**

Table 13.6 Significance Criteria

Magnitude of Change	Landscape and Visual Sensitivity			
	<i>High</i>	<i>Medium</i>	<i>Low</i>	<i>Negligible</i>
<i>High</i>	Substantial	Substantial/Moderate	Moderate	Moderate / Slight
<i>Medium</i>	Substantial / Moderate	Moderate	Moderate / Slight	Slight
<i>Low</i>	Moderate	Moderate / Slight	Slight	Negligible /No effect
<i>Negligible</i>	Slight	Slight / Negligible	Negligible / No effect	Negligible /No effect

Duration of Effects

The duration of effects is an important consideration for developments and corresponds to the following terms. **See Table 13.7**

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Table 13.7 Duration of Effects

Terminology	Definition
Temporary	Effect lasting one year or less.
Short-term	Effects lasting one to five years.
Medium-term	Effects lasting five to ten years.
Long-term	Effects lasting between ten and twenty years.
Permanent	Effects lasting over twenty years and irreversible.

Photomontages and Visualisations

Park Hood base their methodology on the *Landscape Institute Technical Guidance Note 06/19: Visual Representation of Development Proposals*. These include guidance on photographic technology, including camera selection, choice of lens and printing.

The principle function of a photomontage is as an illustrative tool to demonstrate development proposals for the benefit of the consultation process and any planning application. These images have the advantage of providing a high degree of accuracy on the basis of mathematical formulae correlated with OSNI digital survey data.

GLVIA3 states the following:

“Photomontage is the most widespread and popular visualisation technique for illustrating changes in views and visual amenity. A photomontage is the superimposition of an image onto a photograph for the purpose of creating a representation of potential changes to any view”.

Viewpoints are generally identified in locations that are publicly accessible and based on a determination of the actual visibility of the application site or from where there are significant numbers of likely visual receptors.

Photographs taken as high quality jpeg files using a single lens Canon Eos 6D with a fixed focal length lens of 50mm and the following procedures are undertaken:-

- Camera levelled and mounted on tripod with panoramic head to avoid parallax error;
- The proposed development is set as central as possible in the panorama unless there is a specific context which requires inclusion;
- Lens focus set to manual and “infinity” to ensure principal distance (rear nodal point to image plane) coincides with marked focal length;

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- Shoot images with a fixed overlap of 20° for panoramic images;
- Photographs “follow the sun” insofar, views from the east are shot in the morning and views from the west in the afternoon. (Photography was undertaken in October 2020);
- Record the viewpoint elevation including allowance for eye height (average 1.6m) and Northing and Easting OS grid coordinates (via Canon GPS Receiver GP-E2 attachment to camera);
- Record bearing of notable landmarks (even if outside panoramas FOV) if landscape is devoid of strong identifiable elements; and
- Camera EXIF data automatically records date, time, GPS, focal lengths etc.

Photomontage Models

The digital base model is prepared in-house using detailed drawings of the proposed development based on the project drawings, specifications and plans using a combination of Autodesk Civil 3D, Adobe Photoshop CS3 and 3d Studio-MAX. The digital ground model is generated using digital terrain map (DTM) obtained from Ordnance Survey Northern Ireland (OSNI) with a 10m grid. This model is collated and coordinated with the digital site layout, a topographical survey and a digital OSI maps of the site context.

The model was based on dimensions shown in the site layout and for the proposed residential units and coordinated with the landscape works as shown on the plans and layouts submitted with this planning application. The model produced is based on parameters including ridge heights and built element dimensions of the proposed development to inform this study in terms of its scale and nature in the selected views.

Photomontage Presentation

To create the panoramic view photographs are merged together to create a wider image. Panoramas are mapped by planar projection if up to approximately 75° Field of View and, if wider, stitched by cylindrical process using AutoPano-Giga. During the stitching process, none of the photographs are distorted in terms of scaling.

Three viewpoints are given. The first is the existing view from a chosen viewpoint. The one below is a photomontage, an indication of how that chosen viewpoint would look if the development were already constructed along with proposed planting at 10 years maturity. This allows easy comparison and assessment of impacts. The third one shows a wireframe model of the development, placed onto the base model to scale and in the

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correct position to improve comprehensibility of the development within the site and the selected view.

Because a photomontage is based upon an actual photograph, it represents the lighting conditions and seasonality at the time that the photograph was taken. This will change with weather, time of day and season. The photographs were taken in Autumn, when there is less vegetative screening than high summer, so in many of the cases the impact assessments are judged to be conservative.

13.4 Baseline Conditions

Establishing the Study Area

The study area includes the Development Land itself and the wider landscape where the Development may have an influence either directly or indirectly. There is no specific guidance on extents of study areas applicable to this type of development in Northern Ireland. Given the baseline landscape / townscape setting and context, the study area is assessed as being primarily within a short-range area to the east of Newtownards and elevated or exposed lands to its west following site survey work which confirmed any significant views are within this range.

Site Location

The Development Land is located on the eastern edge of Newtownards town off the Ballyreagh Road between the Bowtown Road (to the south) and the B172 Movilla Road to the north. The land is partially within three separate townlands; Bowtown, Ballyalicock and Ballyreagh. **See Figure A**

Landform – Topography and Drainage

The Development Land is located on a low lying but gently undulating landscape approximately 0.6km to 2km north of the Strangford Lough shoreline. The land rises and falls between +35m on Bowtown Road and +55m on the Movilla Road with intervening undulations reaching a maximum of +58.5m. **See Figure 13.1 Existing Site Setting**

The adjacent landscape follows a similar pattern of irregular but low hills though levels to the west, within Newtownards, has been substantially altered to facilitate townscape development.

There are no significant watercourses or ponds on the site. All fields are self-draining with ditches or sheughs located on field boundaries aside or below hedgerows. The most notable watercourse defines part of the eastern boundary and is an unnamed stream within an inconspicuous ditch.

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Photo 13.1 Development Land Setting



View across core of Development Land from Ballyreagh Road demonstrating the open, undulating and rural nature of existing landscape on the Development Land.

Land use and Vegetation

The development land is currently farmland comprising approximately twenty fields in either pasture or arable use. Some fields are less intensively managed and have a rush or more marginal agricultural character.

Fields are bound by hawthorn (*Crataegus monogyna*) and blackthorn (*Prunus spinosa*) dominated hedgerows set on stone or clay banks with sections of colonising scrub including brier, gorse (*Ulex europaeus*) and ivy (*Hedera helix*).

The field structure and layout has remained largely unaltered since the 19th century, when the area was called “Bootown” as annotated on OSNI historical maps. The site boundaries to the east abut open fields in pasture or arable use defined by mixed quality and height hedgerows. To the west and south-west, the boundary abuts housing estates that form part of the wider urban townscape of Newtownards that spreads across the low-lying lands towards the north shore of Strangford Lough. To the north are newer housing estates called Rivenwood and construction sites off the Movilla Road. **See Photo**

13.2 - Existing Site Setting

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Photo 13.2 Development Land Setting



Some parts of the Development Land are subject to minimal management or use and have been colonised by rush grasses and scrub vegetation.

Tree cover is very limited with the topographical survey identifying any trees of substantial size being located within hedgerows or beside older farmsteads. These trees are predominantly self-seeded ash (*Fraxinus excelsior*) and incidental maple, conifer, cypress or fir trees that give parts of the area a deceptively wooded character when viewed from ground level.

A BS5837 Tree Survey Report was undertaken in May 2021 by Andy Boe Independent Arboricultural Consultant and identified trees or tree groups across the site and noted the following:-

- *This site is made up of multiple individual fields bordered by hedgerows of predominantly Hawthorn;*
- *The site has a large population of 327 trees surveyed as individual trees and as groups. The species breakdown notes these are predominantly Ash;*
- *From an amenity, arboricultural and landscape point of view the trees are not noteworthy. A large percentage of the trees have only established through self-seeding;*

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- 95% of the trees have been categorised as C. Trees in this category include unremarkable trees of limited merit, small-growing, young species which have a relatively low potential amenity value, and low landscape benefits;
- 4% of the trees have been categorised as U. Trees assigned to this category are in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years and/or are unsuitable for retention in the proximity of new dwellings or areas of public open space; and
- The remainder (1%) are classed as B. Trees assigned to this category include healthy attractive trees with remediable defects that are in a condition as to be able to make a significant contribution for a minimum of 20 years.

Photo 13.3 Existing Trees and Landscape Character



Existing trees or tree groups are predominantly located in field hedgerows, beside older properties or, as above, Ash trees that have established in roadside hedgerows on Ballyreagh Road.

Settlement and Infrastructure

There are two main farmsteads (No. 54 and 55 Ballyreagh Road) on the core of the site that include extensive sheds, barns and yards. Off Ballyreagh Road are a further seven residential properties (Nos. 35, 46, 48, 50, 52, 52A and 53) which are predominantly bungalows set on sizable garden plots. A cluster of residential properties are located within the recent barn conversion at Woodburn (Nos. 17-23 Ballyreagh Road) to the

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south-east of the site.

Photo 13.4 Existing Building and Farmsteads



Existing farmyard at No. 54 Ballyreagh Road

Photo 13.5 Existing Building and Farmsteads



Existing farmyard at No. 55 Ballyreagh Road

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The OSNI Series One Edition (c. 1830) shows that the extent of housing or building have not significantly increased since the 19th century though some farmsteads have been subject to alteration and extension. The route of Ballyreagh Road (minor) that runs through the core of the site has remained unchanged as has the Movilla Road and Bowtown Road. While the site itself has remained relatively similar, Newtownards to the west extended significantly over the 20th century with housing estates characterising the landscape between the western site boundary and historic town core.

Cornerstown Community Church is located to the north of the Development Land at the junction of Movilla Road and Ballyreagh Road.

The B173 Movilla Road to the north provides a link between Newtownards and Millilise and Donaghadee on the east coast. The Bowtown Road (minor) provides a link to the south-east towards the small village of Loughries and the Ballyblack area on the north of the Ards Peninsular.

Photo 13.6 Local Infrastructure



View west along the B173 Movilla Road opposite the recent Rivenwood development in east Newtownards. The Development Land located in the fields to the left (south)

There is no access to the site from the Movilla, Abbot, Ballyreagh, Fairfield, Greenlea and Burnreagh housing estates to the west of the site. Several of the side and rear gardens of properties within these estates back onto the Development Land. The housing estates comprise detached, semi-detached and terraced houses set off short cul-de-sacs and

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lanes. The estates merge into further urbanised landscapes to the west towards Newtownards town centre (1.8km) including sports pitches, institutional lands, open spaces, graveyards, commercial / retail lands, the airport and substantial brownfield sites.

To the north of Movilla Road, a planning application is currently being processed for the 3rd phase of development comprising 189 no. dwellings, open space and the next phase of the distributor road across 27.21 hectares of lands as part of the Rivenwood Development

Establishing the Wider Study Area – Published Landscape Character Assessments

The *Northern Ireland Landscape Character Assessment (NILCA) 2000* by NIEA identified 130 distinct landscape areas within Northern Ireland. While now slightly dated, it includes broad overview of the landscape character, description, condition and sensitivity for each area and is a useful research document as a base for assessment of this study area.

See Figure 13.2 – Landscape Designations and Policy

The Development Land is located within **Landscape Character Area (LCA) No. 100 Ards Farmlands and Estates**. The NILCA summarises the key characteristics of this LCA as follows: -

- *Smooth, undulating drumlins, with both pasture and arable farmland;*
- *Good hedgerow network but relatively few hedgerow trees;*
- *Waterlogged hollows between drumlins;*
- *Straight roads cross the peninsula, linking to the sinuous coastal road;*
- *Estates provide wooded backdrop to the Lough in some areas;*
- *Stands of trees, often seen in silhouette;*
- *Scattered houses of varying sizes and styles; traditional dwellings are small scale and clustered in form; and*
- *Historic and archaeological features are often prominent local features.*

The NILCA summarises the Landscape Condition and Sensitivity to Change as follows:-

“The landscape is generally in a good condition, although some field boundaries have been lost through neglect. Recent built development sometimes detracts from the rural character of the landscape, particularly in the more open parts of the farmland and where it is out of scale with the small clustered settlements which are typical of the area. However, the many estates and large farm holdings contribute to a relatively high quality landscape in areas where they have an influence. The topography of this landscape

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allows the accommodation of some development but its rural character limits the type and scale of development which may be appropriate.

The relative lack of trees in some farmland areas makes them more sensitive to change, although these areas are generally less sensitive than the coastal edge. The Ards Farmland and Estates landscape has a variety of archaeological and historic sites, including castles, churches, mottes, abbeys and raths. The area is also known for its windmills, which are unique in Northern Ireland. Strangford Lough is one of the largest sea loughs in Northern Ireland and its inter-tidal mudflats are recognised for their nature conservation and earth science value by their designation as an ASSI; the waters are a Marine Nature Reserve. The Lough and shoreline areas are also designated as an AONB."

To the west, the Development Land is located in very close proximity to **LCA 101 Scrabo**. The NILCA summarises the key characteristics of this LCA as follows: -

- *Expansive, relatively open farmland at the head of Strangford Lough;*
- *Scrabo Hill with the tower on its summit, is a dramatic landmark;*
- *Large houses and farms with extensive outbuildings;*
- *Extensive settlement including Newtownards;*
- *Major infrastructure and large scale industrial development; and*
- *Tranquil, secluded wetland landscape on banks of Comber estuary.*

In the *Northern Ireland Regional Landscape Character Assessment (2015)*, the Development Land is located within **NIRLCA 26 Strangford Ards & Lecale**. The characteristics for this NIRLCA are summarised as follows (although those with an * are not relevant to the Development Land itself):-

- *Scenic lowland landscape of smooth, undulating drumlins, which descend into Strangford Lough creating complex islands and lagoons around shores;*
- *Strangford Lough is a major biodiversity resource, designated at international level for its important intertidal habitats and the species they support;*
- *Low rocky coast is windswept with sandy beaches and rocky headlands; **
- *Field boundaries of hedges with relatively few hedgerow trees compared with other parts of Northern Ireland;*
- *Estates with woodlands around Strangford Lough create a wooded backdrop to views from the lough, and stands of beech and pine. Major demesne landscapes include Mountstewart, Castleward and Finnebrogue;*

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- Higher ground to the south (Lecale) with gorse scrub amongst pasture with occasional field boundary walls and gorse filled hedges creating upland or coastal character; *
- Historical sites on volcanic plugs including Slieve Patrick and Scrabo Monument form prominent landmarks. This area is rich in archaeology with a strong sense of history; *
- Minor roads meander round drumlins; main roads cut across them and are straighter;
- Scattered houses of varying sizes and styles, farms frequently on drumlin tops. White finished buildings stand out in the landscape; and
- Settlements are small scale and clustered, larger settlements are on lower ground at river crossing points or coastal bays.

Landscape Description of the Wider Study Area

Newtownards is a large town lying across an area of flat open land at the northern tip of Strangford Lough. Reputedly established in 1606, the town had a population of 28,216 in the 2011 Census.

Photo 13.7 Eastern Edge of Newtownards



View from the B173 Movilla Road looking across open fields (the Development Land) towards the northern part of Ballyreagh Road including the Cornerstone Community Church on the eastern edge of Newtownards.

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While a market town in its own right, the close proximity of Belfast City (16km due north-west) has resulted in its expansion being in part related to it being a commuter settlement. The historical core is centred on the Market House (c.1770) beside Conway Square from which a formal grid of streets merges into commercial and retail estates, residential suburbs including housing estates. The town is at the junction of the A20, A21 and A48 roads as well as being at the convergence of several B and C class roads from surrounding rural areas. There are several large-scale developments on the outskirts of the town, including retail outlets, shopping centres, sports centres, commercial / industry areas and a small airfield.

The housing estates to the west of Newtownards are of a similar layout and concept comprising a mix of detached and semi-detached single, dormer and two-story houses with enclosed rear gardens. The houses are set off small lanes and cul-de-sacs with open front gardens planted with occasional trees and ornamental shrubs. The close proximity of the town and nature of residential and commercial developments has led to fragmentation of the urban / rural edge or interface.

Photo 13.8 East Newtownards



Elevated view from The Meadows off Abbot Drive showing nature of housing and low topography in east Newtownards area

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Beyond the town edge, the lowland areas are sporadically settled with numerous detached houses aligning road corridors and farmsteads or larger houses set back from roads off avenues. Several of the farms have extensive sheds, Dutch barns and working yard areas though the majority of settlement types are single storey properties set on sizeable gardened plots. The farmland has a relatively large-scale pattern, with large farms scattered evenly across the patchwork of arable fields. The relative lack of trees or hedgerows adds to the open, expansive character and allows long views across the landscape towards Strangford Lough to the south.

To the south-east and east, the Ards Farmlands and Estates extends across much of the Ards peninsula draped over a gently undulating and rising landform dominated by a rural farmed landscape that merges into significant wooded estates and demesnes to the south.

Bangor, 6km to the north has a population of 61,011 (2011 Census) and is the third most populous settlement in Northern Ireland.

Landscape and Planning Designations

Planning Designations – Ards and Down Area Plan (2015)

The Development Land is identified within *Volume 2 – Ards Borough Settlement Proposals*, with the site identified on *Map No. 2/002A –Newtownards* and *Map No. 2/002B – Newtownards NS19 Concept Plan*. **See Figure 13.2 – Landscape Designations and Policy**

The Ards and Down Area Plan states the following with regards to **Zoning NS19 - 33.73 Hectares at Ballyreagh:-**

“Development of these lands is reliant upon the upgrade or realignment of the Ballyreagh Road in accordance with Policy TRAN 2, which will bring south and west bound traffic on to the Old Shore Road / Portaferry Roads and westward via the Castlebawn road line. All road works are to be designed and implemented to the satisfaction of the Roads Service of the Department for Regional Development and implementation shall be funded at the expense of the developers of the lands to be served by the road scheme.

Development of the site will only be permitted in accordance with an agreed comprehensive scheme that will incorporate the neighbouring amenity open space (Proposal NS 43), to provide the necessary public infrastructure, including those roads required to serve these lands. The alignment and landscaping of the road shall be designed to achieve the maximum possible degree of integration in the landscape.

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Key Design Considerations:

- *Housing development to be a minimum gross site density of 20 dwellings and a maximum gross site density of 25 dwellings per hectare;*
- *Development shall be phased to begin at the southern end of the site;*
- *Phasing of housing development in relation to infrastructural works;*
- *The Ballyreagh Road will be upgraded to Distributor Road standards or realigned and will provide a link from the Bowtown Road (near the existing junction) to the Movilla Road. The road will terminate at a roundabout on the Movilla Road which will also incorporate the Movilla Road/ Donaghadee Road link;*
- *Provision of Pedestrian and Cycleway links to Movilla Road and Bowtown Road;*
- *The boundaries of the site adjacent to the countryside and the LLPA to be landscaped with an 8 –10 metre deep belt of trees of native species to provide screening for the development and help integrate it into the surrounding countryside;*
- *A full survey of existing vegetation within the site and retention of trees and hedgerows where possible;*
- *Existing mature vegetation and trees along the eastern perimeter of the zoning shall be retained and enhanced with a planting buffer 8-10m deep to consist of indigenous trees and hedgerow species;*
- *Positive management arrangements to protect and maintain open space, and landscaping;*
- *The seven mature trees on the western edge of the Ballyreagh Road and opposite property No. 55 Ballyreagh Road and the cluster of mature trees between property Nos. 53 and 54 Ballyreagh Road to be retained and the positioning of buildings in relation to trees shall be such that development will not threaten the survival of trees; and*
- *The layout shall be designed to provide for maximum permeability by bus services.*

Within the Development Land, the Area Plan identifies an area of designated open space under **Proposal NS 43 Proposed Amenity Open Space and Recreation** in accordance with Planning Policy Statement 8 (PPS 8): Open Space, Sport and Outdoor Recreation as indicated on Map No. 2/002a - Newtownards Settlement Map. The plan states as follows: -

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"7.32 hectares of land to the north and west of Ballyreagh Road is identified as recreation, amenity and open space. This elevated area within the proposed housing zoning at Ballyreagh Road is a local landmark and has the potential to provide a green backcloth to the new housing."

To the immediate south (and beyond the Development Land boundary), is a **Local Landscape Policy Area (LLPA6) "Drumlins and slopes on Bowtown Road"** which is designated on account of prominent drumlins and mature trees.

Map No. 2/001A – Ards Borough North shows Development Land as being within the "Area Plan Settlement". The land to the immediate east of the Development Land is designated an Area of Constraint on Mineral Developments.

Northern Ireland Environment Agency (NIEA) Designations

Strangford Lough, over 500m to the south, carries several planning and environmental designations including Area of Outstanding Natural Beauty (AONB), RAMSAR and Area of Special Scientific Interest.

The AONB boundary extends north and includes the south-east portion of the Development Land (though this is also zoned as part of NS19 in the Area Plan). The site carries no other NIEA designations relating to scenic, ecology, landscape, heritage or other environmental issues.

There are no other NIEA designations or zonings identified on the Development Land.

DfC Historic Environment Division and Cultural Heritage Designations

The house located to the north of the site (and associated NS19 zoning) at No. 117 Movilla Road BT23 3RJ is on the HED Record as a *"Small, plain gabled house built in c.1928 to replace an earlier dwelling; HB24/08/017"*. It is not listed or rated as having architectural or historic interest. The Proposed Development does not include any changes in this area.

To the south of the site, is a *"Stone Wall, former farmstead (possible) of uncertain date; SMR: - DOW006:017"* located off Ballyreagh Road.

Public Footpaths and Rights of Way

There are no public rights of way on the site.

Landscape Quality and Value

The Development Land comprises a rural landscape set on the urban periphery which is largely managed farmland and, in broad terms, the landscape value and quality would be categorised as *medium* based on its "everyday" character and undesignated status.

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The rolling landscape, while attractive in its own right does not possess many notable features other than tree-lined hedgerows to the east of the site and incidental scrubby woodland areas and would not be considered unique or rare in this part of Ireland. The cores of the fields are improved grassland and there is little in the way of any species or landscape diversity away from hedgerows and ditches that would result in a higher category of value.

The east of Newtownards is characterised by extensive housing estates with retail and commercial development aligning the main roads leading from the town centre. Where the urban edge meets the rural landscape, there are often formal and abrupt edges with the adjacent fields being subject to differing management regimes. The Movilla, Abbot, Ballyreagh, Fairfield, Greenlea and Burnreagh estates back onto the Development Land lands and there are variable landscape treatments along the collective boundary which often has resulted in a disjointed and visually poor boundary definition to the rural countryside. However, the Development Land displays no visible signs of anti-social behaviour that are often associated with rural landscapes on town edges.

Photo 13.9 Landscape Features and Sensitivity



Ballyreagh Road is aligned in part by tree lined hedgerows that provide incidental distinctive sections of road as well as visual screening for lands beyond the Development Land.

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Landscape Sensitivity

Landscape sensitivity is based on the ability of the surrounding landscape to accommodate and absorb changes within the confines of the Development Land and the sensitivity of the inherent quality and character.

The more elevated and potentially sensitive landscapes within the site are designated Open Space under Policy NS43 and therefore would be retained as open park or public realm landscape. The LLPA to the south-west will also not be affected by the proposed development.

The site is rated as having *medium* landscape sensitivity on account of it having a limited visual envelope due to a combination both built-up townscape towards Newtownards and the extent of drumlins and mature hedgerows in this area. Longer views are afforded from elevated or exposed areas to the west of Newtownards which are very distant and, in overall terms the Development Land is well concealed from public vantage points.

From the majority of the areas to the periphery of the site, it would be considered that the site has a good ability to absorb changes without significant detriment to landscape or townscape character or visual amenity of Newtownards and the peripheral areas.

Baseline Visual Evaluation

Representative Viewpoints were selected within publicly accessible areas based on the following criteria: -

- Site investigation to establish those locations where there was likely to be significant views (e.g., exposed and elevated landscapes);
- Site investigation to establish those locations where there was likely to be a significant number of visual receptors (e.g., settlement or commuter routes); and
- Ensuring that key areas in the broader study area are covered to give representative likely visual effect.

Close proximity views from publicly accessible areas are limited due to the Development Land being bound by undulating farmland to the east and abutting existing housing estates to the south, north and west. More distant views are afforded from elevated lands towards Scrabo Hill to the west and the lowlands on northern shores of Strangford Lough. There are no views from the town centre areas of Newtownards due to built-form and topography.

Representative viewpoints for the visual assessment were taken from the following locations: -

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- *Viewpoint 1: B172 Movilla Road;*
- *Viewpoint 2: The Meadows;*
- *Viewpoint 3: Bowtown Road/ Ballyreagh Road Junction;*
- *Viewpoint 4: Bowtown Road;*
- *Viewpoint 5: Public Footpath on Strangford Lough shoreline, Newtownards Airport;*
- *Viewpoint 6: A21 Comber Road; and*
- *Viewpoint 7: Scrabo Tower.*

13.5 Prediction of Landscape and Visual Impacts

Introduction

The terminology and glossary used in this chapter to describe landscape and visual effects is based on a review of the Principles and Overview of Processes (Chapter 3) of GLVIA.

The magnitude and significance of any effect is determined by the scale and shape of the Proposed Development and any resulting contrast between this and the existing landscape setting and visual amenity. A further consideration is not just its proximity to adjacent properties or lands but also the number of people who use or pass through this area who may feel that the visual and landscape quality of the area has been affected by this proposal. Impacts are not necessarily adverse and may be neutral (i.e., changes which make the existing situation neither better nor worse), or beneficial, following the removal of an existing visual detractor.

Any assessment must be measured against that of the situation that pertains at present. In the case of this site, it is currently farmland which is predominantly “medium” in terms of landscape quality, value and sensitivity. The lands to the west, south and north have been affected by the close proximity of the town edge and busy roads and are parts of a jagged rural/town interface but the wider site has an attractive rural setting comprising rolling agricultural fields and hedgerows.

Proposed Development Summary

The outline proposal is for a residential and open space development in line with the NS19 and NS43 designations respectively as set out in the Ards and Down Area Plan 2015.

In summary the development comprises the following:-

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- A residential neighbourhood comprising 675 dwellings, based on the principles of an interconnected street network, urban blocks, open space and mixed uses;
- Construction of principal access via a new distributor road linking Bowtown Road to Movilla Road;
- A street-led development form supporting walkable neighbourhoods that prioritises walking, cycling and public transport ahead of the car;
- Extensive landscape works related to public amenity spaces including 10m wide boundary planting, landscape buffers, a centrally located town park, cycle/pedestrian routes, amenity planting, semi mature trees, extra heavy standard and standard garden trees, hedgerow planting and meadow / wildflower and grass seeding works across a minimum of 7.3 hectares;
- Provision of open spaces including formal and informal recreational areas and an amenity children's play strategy based on creating Local Areas of Play, Local Equipped Areas of Play and Neighbourhood Equipped Areas of Play.

Landscape Mitigation Measures

The appearance of the development is a major influence on how the site is perceived by the public so the outline designs include for extensive landscape design considerations with the overall objective of providing a layout that integrates the development into the surrounding townscape / landscape. This includes designing of streetscape, open spaces and other external areas as shown on the Landscape Design drawings. **See 6451 L0001 Outline Concept Masterplan and Figure 13.3 Proposed Site Setting.**

At outline design stage, the key landscape mitigation measures include the following: -

- The construction work will be limited to specific areas away from existing trees, priority hedgerows, and watercourses allowing for their retention;
- Retention of the 7 no. mature trees on the western edge of the Ballyreagh Road and opposite No. 55 Ballyreagh Road and the cluster of mature trees between Nos. 53 and 54 Ballyreagh Road as per Zoning NS19 requirements;
- The site layout will ensure properties face areas of open space (and streets) to provide passive supervision / ownership ensuring no hidden corners (as per Space Syntax research and recommendations);
- Provision of new cycle and pedestrian linkages between Movilla Road and Bowtown Road as per Zoning NS19 requirements;

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- Retention of elevated lands to the west of the site as open space in line with objectives of Zoning NS43 for recreational and amenity purposes;
- Landscape buffer zones and open space retained around existing trees and watercourses as well as 8-10m buffers planted aside adjacent LLPA as per Zoning NS19 requirements;
- Landscape works to assist with visual integration and screening; and
- Linking on open spaces and linear parks via a readily identifiable access corridor.

Figure 13.1 Proposed Site Layout and Landscape Works



Extract from Drawing No. 6408 L0001 Proposed Site Layout showing extent of project and associated landscape and parkland works

The landscape works include for planting of trees to create wooded strips across the proposed development which will be planted at semi-mature' or 'extra-heavy standard' size to provide an instant impression. The collective trees will, as they mature, assist in merging the proposed development into the surrounding landscape and views from

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more distant areas towards Strangford Lough shoreline and elevated areas to the west. Other landscape works will include structure planting, amenity planting, garden trees, hedgerows and buffer wooded belts.

Bio-diversity measures including bat and bird boxes are also proposed and will be undertaken under direction from site ecologists.

Peripheral trees and hedgerows are will be overhauled to remove dead, dying and dangerous branches and any colonising scrub or brier. For retained trees, the recommendations given in *BS5837:2012 Guide for trees in relation to construction* will be adopted to ensure site and tree safety.

Planting and augmentation of existing boundary hedgerows will consist of evergreen and deciduous trees with under-story scrub mix. A range of plant species and heights will be selected to provide quick establishment and assist in visual integration. Plants selected will be predominantly indigenous and species selection as per NIEA Native Species Lists to ensure successful plant establishment that will merge visually and ecologically into this area.

Landscape works will be undertaken by an ALCI approved landscape contractor and in accordance with *BS 4428:1989 Code of practice for general landscape operations (excluding hard surfaces)*. Any trees or shrubs dying, damaged or removed will be replaced in the following planting session with plant of similar size and species. Trees supply and planting shall correspond to *BS 8545 Trees: from nursery to independence in the landscape - Recommendations*.

Landscape Management and Maintenance

Zoning NS19 states under "Key Design Considerations" that there should be "*Positive management arrangements to protect and maintain open space, and landscaping*". The management of all areas will initially be undertaken by an ACLI approved landscape contractor with the developer remaining as client for duration of their contract for each phase of the development. After 12 months the maintenance will be handed over to the long-term Management Company who will take over maintenance of set areas on completion of the development.

There will be a five year guarantee after construction that all the proposed planting works still exists and has established in line with landscape design expectations. This will ensure that no planting has been removed or damaged due to the subsequent construction or plant failure.

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The detailed or reserved matters planning application will be accompanied by Landscape Management and Maintenance Plans setting out the objectives for management of external spaces or public realm areas for a 20 year period.

Regular monitoring will be undertaken to determine success of landscape operations and ensure they are behaving in the manner anticipated at design stage. If required, elements of the design can be adapted to accommodate changes required by actual field experience.

Predicted Landscape and Visual Effects during the Construction Period

The nature of groundworks, construction activity, road and house building and associated infrastructure will mean that the Development Land will be subject to a *substantial* alteration on account of re-grading and profiling works as each phase is undertaken. As per Zoning NS19, the "*Development shall be phased to begin at the southern end of the site*" and there is likely to be *temporary moderate to substantial adverse* effects during the construction period including a slight increase in existing levels of local traffic. Taller elements involved in the construction works, such as cranes are likely to have further localised negative visual impacts during this period.

Additional effects will derive from movements associated with construction, traffic and associated disturbance though such effects will be limited to entrance points areas off Movilla Road and Bowtown Road.

The retention of boundary vegetation and erection of screen hoarding will limit the extent of any negative impacts derived during the construction period.

Landscape Effects – Development Land

The proposals will result in *permanent* changes to the landscape character on the Development Land and introduce a built townscape character across the NS19 designated lands including buildings and landform changes that will essentially change its context to a residential or urban area. From the adjacent sections of the Movilla Road and Bowtown Road, there would be a conscious feeling the urbanised form has moved east beyond the current town edge. This will equate to a *moderate to substantial* change in the sense of place but would not necessarily be one of an adverse nature as the Landscape Masterplan includes significant landscape and open space development that would contribute to the local landscape character in the medium to longer term.

The lands are currently in farming use across large to medium open fields but the proximity of adjacent housing estates ensure it is not an area that would be considered

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a pristine or sensitive landscape. The only distinctive landscape features on the site are the trees near the existing farmsteads or aside sections of Ballyreagh Road and the outline site layouts include and retain these as part of the open space. The mitigation landscape works include additional planting to site boundaries and internal open spaces which will assist in absorbing the development into the local landscape setting by the medium term.

Given these factors and the NS19 designation, the changes would not be unacceptable in landscape character terms.

Landscape Effects – Residential Areas to East Newtownards

The residential estates to the west (towards Newtownards town centre) are internally focused backing onto the Development Land. The proposal will result in limited changes to the internal character of these areas but they will no longer be seen as the outskirts of the town with the landscape to their east being integrated into townscape which will have slight effects on the wider “sense of place”. The retention of a large area of open space as per NS43 zoning to the west of the Development Land will ensure that visual impacts to the majority of properties in the Movilla, Abbot, Ballyreagh, Fairfield, Greenlea and Burnreagh estates will not be of a significant nature and largely of a *neutral* nature. The development offers the opportunity to provide a logical and readable urban / rural edge at the revised town edge boundary.

The retention of existing trees and hedgerows on the site periphery and siting of open space (NS43) areas will assist in absorbing the development into this urban / rural edge but there will be short to medium term adverse effects to the character of immediately adjacent housing estates as adjacent phases of development are completed. Further, this open space development as “parkland” will ensure increased local amenity and recreational areas for these residents.

Beyond those houses that abut the Development Land, the effects on character reduce appreciably due to intervening vegetation and built elements and the character of these areas is already of a very urban nature. Any significance and magnitude of effects will reduce over time as the landscape matures as the proposal allows for retention and augmentation of existing boundary vegetation.

Landscape Effects – Newtownards

Newtownards is located primarily on a lowland landscape with the historic town centre approximately 1.9km distant that merging into townscape including commercial, retail, residential housing areas and suburban townscapes on rising lands to the north and east (towards the Development Land). The effects on the character of the core of the

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Newtownards, its open spaces and parks will be *negligible* on account of the nature of townscape, vegetation and topography closing off views towards the Development Land.

In terms of the wider town's character, the key consideration is how the proposal may impact the eastern edge and any sense of arrival / place for those arriving on the Movilla Road and Bowtown Road. This part of Newtownards possesses little in terms of amenity, recreation or cultural heritage features and has a "community" rated or medium quality townscape / landscape so the magnitude or significance of any change is limited.

From the adjacent section of these roads, there would be a conscious feeling the urbanised form has moved beyond the current town edge across lands formerly perceived as farmland resulting in *slight to moderate* effects mainly due to a change in sense of place and the feeling Newtownards has "grown". The location and context ensure it will not have significant or unacceptable effects on the quality or appreciation of this part of Newtownards and any significance and magnitude will reduce over time as the landscape works and vegetation mature.

The existing landscape condition, quality, sensitivity and character would have been major factors in the designation within the Area Plan of these lands under policy NS19 for residential and housing use.

Landscape Effects – LCA 100 Ards Farmlands and Estates, LCA 101 Scrabo, and NIRLCA 26 Strangford Ards & Lecale Landscape Character Areas

There will be *no* effects on the landscape character to the vast majority of these landscape character areas due to topography, vegetation and built environment. The proposed development would not change the actual character of the LCA apart from areas near and aside the Development Land as assessed above. There will be a *slight* effect in longer views from exposed or elevated landscapes with the extension of the urban form of Newtownards being discernible but this would not be something that would be readily appreciable or have a significant effect on any appreciation of landscape, setting or context. Effects are largely rated as *neutral*.

The retention of tree belts and boundary hedgerows in conjunction with planting of 10m woodland buffers (in line with NS19 zoning objectives) will assist in the broader integration of this development into the landscape setting. In time, the site would have a wooded and green character but the incidental built development would constitute a *slight* change to the landscape character of this area.

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Table 13.8 Landscape Effects Summary

Area	Landscape Value and Sensitivity	Predicted Magnitude of Change	Overall Significance of Effect
Development Land	Medium	High	Substantial
Residential Areas - Movilla, Abbot, Ballyreagh, Fairfield, Greenlea and Burnreagh	Medium	Medium	Slight
Newtownards	Medium / High	Low	Slight / Negligible
LCA100 Ards Farmlands and Estates, LCA 101 Scrabo and NIRLCA 26 Strangford Ards & Lecale	Medium / High	Low	Slight / Negligible

Visual Effects

The following tables summarise the likely and anticipated effects on views or visual amenity from the seven representational viewpoints as identified as part of the baseline visual assessment above. Photomontages and wirelines of the proposed development are depicted on **Figures 13.6 to 13.19** and these correspond to the following tables.

Table 13.9 Viewpoint 1 – B172 Movilla Road

Summary	B172 Movilla Road	Distance to Development Land	Less than 5m
LCA	LCA100 Ards Farmlands & Estates and NIRLCA 26 Strangford, Ards and Lecale	Relevant Designations	None
Viewpoint Baseline	Travelling west towards Newtownards, views of the Development Land area from the Movilla Road are largely obscured by undulating landscape and topography until in the Ballyalcock area on the eastern outskirts of the town. The road has a busy characteristic and is a		

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	<p>notable link between Newtownards and Millisle or Donaghadee to the east.</p> <p>The wide road provides access to a number of commercial and residential estates as well as construction sites. To the south, there are expansive, oblique and open views over the northern part of the Development Land.</p>
Viewpoint Sensitivity	Medium – road users and adjacent residential properties
Predicted Change	<p>The proposed development will be a discernible change to views from this section of Movilla Road altering it from one of predominantly rural fields to being one set between residential housing estates with <i>substantial</i> effects to visual amenity. The key change will be the sense that townscape has extended and this represents a significant expansion of built environment in north-east Newtownards</p> <p>Effects will derive from a new road junction, introduction of residential properties and landscape works that will collectively serve to close off the oblique views for this part of Movilla Road.</p>
Significance Summary	Substantial: The proposal will be a major change to the view with residential development visible in the foreground.

Table 13.10 Viewpoint 2 – The Meadows

Summary	The Meadows off Abbot Drive, Newtownards	Distance to Development Land	250m
LCA	LCA100 Ards Farmlands & Estates and NIRLCA 26 Strangford, Ards and Lecale	Relevant Designations	Community Woodland
Viewpoint Baseline	To the west of the development site is extensive area of predominantly late 20 th century housing estates including Movilla, Abbot, Ballyreagh, Fairfield, Greenlea and Burnreagh. In general, views from these areas are restricted by existing townscape and vegetation. A community woodland with a series of informal and formal paths is located between Abbot Drive and E Mount on a local elevated rise that allows		

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	glimpse views at gaps over the housing estates. This representative viewpoint is from the one location where such views are afforded in the direction of the proposed development lands.
Viewpoint Sensitivity	Medium – park users and walkers
Predicted Change	The proposed development will be visually obscured by an intervening ridge to the west of Ballyreagh Road which has established woodland near Greelea Crescent.
Significance Summary	Negligible. The proposed development will be visually screened ensuring no visual effects on this community woodland.

Table 13.11 Viewpoint 3 – Bowtown Road/ Ballyreagh Road Junction

Summary	Junction of Bowtown Road and Ballyreagh Road	Distance to Development Land	Less than 5m
LCA	LCA100 Ards Farmlands & Estates and NIRLCA 26 Strangford, Ards and Lecale	Relevant Designations	Strangford Lough AONB and LLPA 6
Viewpoint Baseline	This is a close proximity view adjacent to the southern edge of the Development Land near the Gregstown Park housing estate. An open view is afforded to the north and north-east over the very southern part of the Development Land and part of a Local Landscape Policy Area (LLPA6) to the north of Bowtown Road.		
Viewpoint Sensitivity	Medium – road users and adjacent residential properties		
Predicted Change	<p>The most evident change in this area will be the widening of the Ballyreagh Road and junction improvements to the connection onto Bowtown Road. This will entail removal of some scraggly roadside hedgerows (which will be subsequently replaced) and have a <i>substantial</i> localised effect.</p> <p>The residential areas proposed as part of this development are set back approximately 200m from Bowtown Road and the intervening field (part of the LLPA) will be retained as open space. Aside from the</p>		

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	<p>road improvements, the implications of the housing on this section of Bowtown will not be significant.</p> <p>The mitigation works include for tree planting to the south of the development area that would as they mature limit views of the proposal and consequent visual impacts.</p>
Significance Summary	<p>Substantial: Primarily related to the roadworks with the residential development having Slight effect being a minor component in the wider view and any awareness would not have a marked effect on the overall quality of the view.</p>

Table 13.12 Viewpoint 4 – Bowtown Road

Summary	Bowtown Road, Ballyreagh	Distance to Development Land	295m
LCA	LCA100 Ards Farmlands & Estates and NIRLCA 26 Strangford, Ards and Lecale	Relevant Designations	Strangford Lough AONB and ACMD
Viewpoint Baseline	<p>For those travelling towards Newtownards from the east on the Bowtown Road (minor), views of the Development Land are obscured by undulating topography and hedgerows until in the Ballyreagh townland. The majority of the Development Land is obscured by an accumulation of field hedgerows and hills but areas to the south-west which are elevated become visible on incidental and exposed sections of Bowtown Road once west of Seaview Farm.</p>		
Viewpoint Sensitivity	<p>Medium – road users and adjacent residential properties</p>		
Predicted Change	<p>Part of the proposed development will be visible with <i>moderate</i> effects on existing views. The majority of fields will remain as “green” farmland but there will be a noticeable change as parts of the rural landscape aside Ballyreagh Road are changed to residential areas. New houses will be visible within the Development Land and change the view context from one that is more urban in nature.</p>		

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	The mitigation works include for 10m buffers of woodland planting on the site boundary that would, as they mature, limit views of the proposed development and consequent visual impacts.
Significance Summary	Moderate: The proposal is likely to form a readily apparent component within the overall view but the baseline characteristics will continue to prevail.

Table 13.12 Viewpoint 5 – Public Footpath near Newtownards Airport

Summary	Footpath on Strangford Lough shoreline to south of Newtownards Airport lands.	Distance to Development Land	Over 1km
LCA	LCA 101 Scrabo and NIRLCA 26 Strangford, Ards and Lecale	Relevant Designations	Strangford Lough AONB, ASSI, ACMD, RAMSAR and LLPA 5. Near WWII Strongpoint / Sea Wall (IHR DHP66)
Viewpoint Baseline	<p>A public walkway links the Portaferry Road (A20) and the Newtownards Road (A21) to the south along the northern shoreline of Strangford Lough. This is a well-used local amenity offering expansive views across the lough, local airport and inland towards elevated lands including Scrabo Tower and Whitespots.</p> <p>The development lands are located primarily behind an intervening low ridge which is part of the built-up townscape of south-east Newtownards (including the housing estates off Teal Rocks and Gregstown Park).</p>		
Viewpoint Sensitivity	High - recreational users		
Predicted Change	<p>Part of the proposed development will be just discernible with <i>slight</i> effects on the broader context and make-up of the panoramic view. The residential development will have a low profile in the landscape and view but it will give a sense that Newtownards has extended eastwards.</p>		

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	Given the distance and nature of the view, the effects on views from the footpath would not be of a significant and barely perceptible.
Significance Summary	Slight: Proposed development will form a minor component in the wider view and any awareness would not have a marked effect on the overall quality of the view.

Table 13.12 Viewpoint 6 – A21 Comber Road

Summary	A21 Comber Road	Distance to Development Land	3.6km
LCA	LCA 101 Scrabo and NIRLCA 26 Strangford, Ards and Lecale	Relevant Designations	Strangford Lough AONB, ACMD and LLPA 5
Viewpoint Baseline	The A21 Comber Road is part of a busy (partially dual carriageway) link between Comber and Newtownards that traverses the flat lowland landscape just to the north of the Strangford Lough shoreline. There are expansive views across the open rural landscape towards Newtownards, the Hollywood Hills Scrabo Hill, the undulating hills of the north of the Ards Peninsular and Strangford Lough.		
Viewpoint Sensitivity	Medium to high– road users and recreational uses on adjacent walks		
Predicted Change	<p>Part of the proposed development will be discernible from this section of road with <i>slight</i> effects on the broader context and make-up of the panoramic view. The residential development will have a comparatively low profile in the landscape and view but it will give a sense that Newtownards has extended eastwards.</p> <p>The proposals include for landscape works which will serve to assimilate it into the view as it matures tying it visually into the adjacent farmland or residential area character. Given the distance and scale of panoramic view, the effects on views from the Comber Road would not be of a significant or unacceptable nature in visual amenity terms.</p>		

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Significance Summary	Slight: Proposed development will form a minor component in the wider view and any awareness would not have a marked effect on the overall quality of the view.
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Table 13.11 Viewpoint 7 – Scrabo Tower

Summary	Scrabo Tower	Distance to Development Land	3.5km
LCA	LCA 101 Scrabo and NIRLCA 26 Strangford, Ards and Lecale	Relevant Designations	Strangford Lough AONB, ACMD and LLPA 5
Viewpoint Baseline	<p>Scrabo Tower is landmark 41m high 19th-century lookout tower or folly that stands on Scrabo Hill (+160m) built on the site of a prehistoric hill fort. The tower is located in Scrabo Country Park which is open to the public and managed by NIEA. There are expansive views in all directions including Newtownards, Strangford Lough and, on clear days, Scotland. The Development Land is discernible to the east of Newtownards.</p> <p>The tower is currently closed to the public but the Country Park is open and accessible all year round.</p>		
Viewpoint Sensitivity	High – tourist and visitors who visit this notable viewpoint.		
Predicted Change	<p>The proposed development will be discernible from this elevated viewpoint with <i>slight</i> effects on the broader context and make-up of the very panoramic view. The residential development will have a comparatively low profile in the landscape and view but it will give a sense that Newtownards has extended eastwards.</p> <p>The proposals include for landscape works which will serve to assimilate it into the view as it matures tying it visually into the adjacent farmland or residential area character. Given the distance and scale of panoramic view, the effects on views from the Scrabo Tower would not be of a significant or unacceptable nature in visual amenity terms</p>		

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Significance Summary	Slight: Proposed development will form a minor component in the wider view and any awareness would not have a marked effect on the overall quality of the view.
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13.6 Conclusion

The Development Land is located off Ballyreagh Road (minor) on the eastern edge of Newtownards between the Movilla Road and Bowtown Road. It comprises 41.05 hectares / 101.5 acres of land which is part of the NS19 Housing Zoning and NS43 Open Space Zoning (as per Ards and Down Area Plan 2015).

The site is an ordinary agricultural landscape possessing features common to many Irish rural areas made up of large open fields bound by variable quality hedgerows and incidental tree groups. It abuts housing estates at Movilla, Abbot, Ballyreagh, Fairfield, Greenlea and Burnreagh estates to which there are mixed quality boundary and landscape treatments. East Newtownards is characterised by extensive housing estates merging into retail and commercial areas towards the centre of the town.

Site surveys found that the site was not prominent in views beyond the Development Land apart from short sections of Movilla Road and the Bowtown near the Development Land and distant views from elevated or exposed lands to the west of Newtownards.

Proposed Development

The proposal is for development of 675 no. residential units (across 33.73 hectares / 83.34 acres), public open space (across 7.32 hectares / 18.1 acres) with children's play areas, local distributor road, pedestrian and cycle networks, associated landscaping and site access works.

Predicted Significance of Landscape and Visual Effects

While the Development Land has predominantly rural characteristics, the close proximity of Newtownards and the nearby land-uses affect the "sense of place" and baseline landscape and visual setting.

The proposed development will introduce an urbanised character across the NS19 Housing Zoning designated lands including buildings, landform changes and landscape works that will alter its context to a residential area with significant effects on the Development Land itself.

For areas on and immediately aside the Development Land, there would be a conscious feeling that "urbanisation" has moved beyond its current town edge across farmland which will equate to a localised significant change to the sense of place but would not

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necessarily be one of an adverse nature. The landscape proposals include extensive planting, open space (in accordance with the NS43 Open Space Zoning) and structural landscape development, including 10m woodland buffers on the site boundary, which would contribute to the setting in the medium to longer term. The collective landscape works will reduce the significance of landscape effects as they mature and merge the development into the surrounding landscape.

There will be negligible / not significant effects on the broader landscape character to the vast majority of LCA100 Ards Farmlands & Estates, LCA 101 Scrabo and NIRLCA 26 Strangford Ards & Lecale due to distance and extent of intervening topography, vegetation and built environment.

Towards the centre of Newtownards, the undulating topography and townscape obscure the proposed development area ensuring there will be negligible / not significant effects. The proposed development will be more discernible from elevated or exposed landscapes to the west of the town including distant views from part of the Comber Road and Scrabo Country park. Where views are afforded, they are of a distant nature and the proposed development would be a small part of a wider panoramic view so effects would be of a limited nature (slight and not significant).

In no instances, away from the immediate Development Land, would the proposed development be prominent or result in significant landscape or visual effects.

Chapter 14: Cultural Heritage

14.1 Introduction

Background

It is proposed to develop an area of 41.05 hectares between Bowtown Road and Movilla Road, Newtownards (refer to Figure A in Appendix 1). The site is zoned in the Ards and Down Area Plan (ADAP) for housing under zoning NS 19, and includes the zoning NS 43, 7.32 hectares, which is open space zoning (Figure 1 in Appendix 14). The number of dwellings to be accommodated in the zoning is 675 and the development will be phased.

This report forms an archaeological desk top assessment of the proposed development and has been prepared cognisant of previous requests for such reports by the local planning authority. It describes the archaeological baseline of the site and the surrounding area; assesses its archaeological potential and details the archaeological mitigation which should be agreed and implemented prior to construction works commencing.

Development Site

The proposed development site is spread over an area of 41.05 hectares and was inspected by a fully qualified archaeologist. The site is crossed by the Ballyreagh Road a small road which extends roughly east – west through the development area. In general, the area is gently undulating and consists of fields of relatively well-maintained pasture. Nothing of archaeological significance was identified during the inspection.



Plate 1: View across the development area looking southeast from Ballyreagh Road



Plate 2: View across the development area looking south from existing development.



Plate 3. View across the development area looking south from the Movilla Road.

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The development site contains a number of buildings which may appear on the early edition OS maps. These include the farmhouse at 55 Ballyreagh Road (plate 4), the cottage at 83 Movilla Road (plate 5), an outbuilding at 54 Ballyreagh Road (plate 6) and boundary wall on Greenlea Crescent (recorded in the SMR as DOW 06:17)(plate 7).



Plate 4: the rear of the farmhouse at 55 Ballyreagh Road.



Plate 5: original cottage at 83 Movilla Road.

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Plate 6: possible original outbuilding at 54 Ballyreagh Road.



Plate 7: Surviving element of the boundary wall at Greenlea Crescent.

14.2 Archaeological Baseline

Cultural heritage assets relevant to the proposed development

A desk top survey was conducted to identify the location of known cultural heritage sites relevant to the proposed development site. A wider study area extending up to 1.2km from the edge of the development site was also examined. This was deemed to be a sufficiently extensive area to allow for an assessment of the archaeological potential of the development site. The following sources were inspected to form the archaeological baseline:

Data Source	Results
Sites and monuments Records (SMR)	23
Industrial Heritage Records (IHR)	10- none relevant to proposed development
Historic Buildings Records (HBR)	4- none relevant to proposed development
Historic Gardens Register	None in study area
Defence Heritage Register	8- none relevant to proposed development
Battle sites	None in study area
Aerial Photography	No sites identified within available aerial images
Excavations database	5 in study area; 2 relevant to the proposed development
Pre-Ordnance Survey maps	None in study area
Early edition Ordnance Survey Maps	First edition onwards

A review of the various databases identified a single known archaeological site within the red line boundary for the proposed development (Figure 2). This is site DOW 06:17 which is recorded as the truncated remains of a house which is shown on both the early edition OS maps¹. An inspection of the early editions of the OS maps was also undertaken (Figures 3-5). This identified 8 structures/ farm complexes within the development area. This suggests that

¹ When the original desk top survey was conducted in 2019 the SMR database in correctly showed site DOW 06:17 to be located outside the red line boundary.

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Property No.	OS Mapping	Current Status
1	1 st -3 rd editions	Existing house structure is upstanding but abandoned and appears to match alignment shown on earl edition OS maps. Outbuildings shown on maps no longer evident
2	1 st -3 rd editions	Cottage shown on 1 st edition fully survives and is in excellent condition. Additional buildings shown by the time of the 3 rd edition have now been replaced with modern structures.
3	1 st -3 rd editions	Most of the original buildings have been replaced by modern structures. Elements of one of the buildings shown on all three editions may survive.
4	1 st -3 rd editions	Not possible to visit but aerial imagery would suggest that most above ground elements of this site are no longer evident but low level footprint may survive.
5	1 st -2 nd editions	All buildings replaced with modern structures.
6	1 st edition only	No evident remains
7	1 st -3 rd editions	Site heavily overgrown but some elements appear to survive in derelict condition. Site recorded in SMR as DOW 06:17

Looking beyond the development area a total of 23 archaeological sites and monuments were identified within the study zone (Figure 2).

The site **DOW 6:11** is identified as a Mesolithic Occupation site. It is located on the east shore of Strangford Lough. The foreshore is stoney with estuarine mud flats beyond that exposed across to the western shore at low tide. The Newtownards/ Portaferry Road runs beside the shore and on the inland site, flat ground runs to a raised beach some 100m inland. Mr. Ted Griffiths of Ards Historical Society reported finding some Mesolithic material at this spot. Such material has been found on a number of other shore sites around the Lough and on some of the islands.

The site **DOW 6:12** is identified as an enclosure of uncertain date. It is described as having a splendid vantage point with panoramic views over Newtownards across the Lough to Scrabo

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Tower and to the Mourne Mountains beyond and down the length of Stangford Lough to the south. The field has been reseeded and the site has been completely ploughed out, even the curve in the hedge boundary as shown on the OS maps is no longer so pronounced. The owner reported that the curve of the ditch can be seen as a dark line in the soil during ploughing. He added that a tunnel reputedly lies just southeast of the enclosure.

The site **DOW 6:13** is identified as the Early Medieval settlement centred around Movilla Abbey. It is described as having been founded by St. Finian in the 6th century. Some remains of the medieval church survive, consisting of the nave and chancel, built of split stone, with sandstone dressings. A number of Anglo-Norman coffin lids are set in the N wall for display and an undressed slab which is the only tangible fragment from the Early Christian foundation, and which bears a ring headed cross and the inscription in Irish "A prayer for Dertrend". Excavations have shown that the site extended north of the present abbey into what is now a housing estate. Further investigations were carried out about 40m northeast of Movilla Abbey, close to the sites of the earlier excavations. Six, 2m wide, test-trenches totalling some 150m in length were opened across the development site but nothing of archaeological significance was noted. Ground works c.100m east of the abbey were also carried out under archaeological supervision but no archaeological features or artefacts were found.

The site **DOW 6:21** is identified as a coffin lid of medieval date. It is described as an Anglo-Norman coffin-lid, possibly from the graveyard of the old parish church that is thought to have been south of Greenwell Street, was stored in the Greenwell Street Presbyterian Church. However when the church was visited, the slab could not be located, & neither the sextant nor an elderly member of the church knew anything about such a stone. It is possible that the coffin-lid was removed to some place else when the old Presbyterian church was demolished & a new one built in 1972.

The site **DOW 6:23** is identified as a well of uncertain date. It is described as giving the name to Greenwell Street. that runs south of the site. Cordner wrote that "The Green Well was so called because the water was covered with green weed... It was of the usual stone-lined type & roofed by a cap- stone. Stone steps gave access to the water". The site of the well is now near a manhole in a tarmac area of a grass bank north of the front entrance to the Greenwell Street Presbyterian Church. An elderly local resident can recall his mother carrying water from the well to their house nearby.

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The site **DOW 6:33** is identified as find scatter believed to be located in the Ballyreagh Townland. This is a probable Later Mesolithic site, based on the finding of number of butt-trimmed flakes found by a local collector. The site is unlocated and the current whereabouts of the flints is unknown.

The site **DOW 6:35** is identified as a WWII pillbox which is also recorded in the Defence Heritage Register as **DHP no. 46**.

The site **DOW 6:36** is identified as WWII pillboxes also recorded in the Defence Heritage Register as **DNP no.62**. No further information is currently available on this site.

The site **DOW 6:37** is identified as WWII pillboxes also recorded in the Defence Heritage Register as **DNP no.113**. No further information is currently available on this site.

The site **DOW 6:39** is identified as a linear ditch which was exposed through archaeological excavation. The ditch was 0.6-0.8 meters wide and 0.2 meters deep at the terminus but gradually deepening to 0.9 meters at the eastern end. Radiocarbon dating was carried out and revealed that the ditch was excavated initially in the medieval period.

The site **DOW 6:40** is identified as a burnt mound which was exposed through archaeological excavation.

The site **DOW 6:41** is identified as a vernacular house which was exposed through archaeological excavation. This building appears on the first edition Ordnance Survey County Series (1834). Pottery found in the foundation during excavation has been dated to the 18th century, suggesting that it was constructed towards the end of the 18th century. The house narrowed from north to south with the dimensions of the house being 5m (north wall) x 10.3m (east wall) x 4.85m (south wall) x 10.6m (west wall) externally. It was built using irregularly coursed stone bonded with cream lime mortar. The house appears to have been occupied over three phases in the 18th, 19th and early 20th century, each altering the layout and design of the dwelling.

The site **DOW 6:42** is identified as a stone lined pit which was exposed through archaeological excavation. It was 2m long, 1.6m wide and 0.4m deep, orientated north to south. The pit contained burnt cracked stones surrounded by dark grey sand silt. The side and base of the pit where cracks had formed in the rock was filled by dark blue compact clay, it appears that this might have acted as a waterproofing for the pit. Radiocarbon dating from the pit places it in the Early Bronze Age.

The site **DOW 6:43** is identified as a burnt mound and adjacent hearths which were exposed through archaeological excavation. The pit was oval in shape; 2.5m long, 1.8m wide and 0.4m deep and orientated east to west. The pit was filled with charcoal clay and had a

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greasy texture possibly from animal fats from roasting, underneath this layer and comprising 40% of the fill of this pit was burnt cracked stones. Radiocarbon dating from the pit places it in the Early Bronze Age. Two hearths were found in proximity to this pit.

The site **MRD 148:8** is identified as a stone quay of post-medieval date. It is described as a rectangular stone spread formed by medium-sized stones may be the remains of a quay. The sloping foreshore here is composed of small stones, beyond which, especially to the south, are larger stones and boulders on gravel. The feature is generally one course high and measures 34m long east-south-east to west-north-west by 4.5m wide at the landward end, and 4.3m wide at the seaward end. The west-north-western, landward end merges with the gravel shore surface. One average-sized stone forming the structure is about 40cm by 25cm by 7cm. The quay is not shown on any editions of the OS six-inch map, but a building adjacent to the shoreline here is marked on the 1834 and 1858 editions.

The site **MRD 148:9** is identified as a ford of uncertain date. The remains are probably the landward end of a ford. It is situated on a foreshore of natural mudstone, with sandy patches and small- to medium-sized stones. The feature is roughly H-shaped, the inner edges of the arms being 70cm apart and the total width to the outer edges 2.0m. It is constructed using small beach-rolled stones heaped together and measures 34m in length. Some evidence of infill in the centre is visible for a 7.0m stretch. About 220m north-west of this structure is a circular cairn-like mound of stones 2.5m in diameter and 85cm high. This lies on sand which is firm underfoot, in an area free of stones. It is not shown on the OS maps of 1833, 1858 or 1920.

The site **MRD 148:10** is identified as a stone and wooden fish trap of uncertain date. The remains of a roughly V-shaped fish trap lie on largely stone-free flat sand close to the northern end of Strangford Lough. The fish trap is formed by two leaders now 110m apart, with a substantial stream, some 11m wide, flowing south-south-east between them into the main body of the lough. Both leaders are visible as spreads of small to medium stones, one course high, and both appear to be associated with a series of post-stumps. The stone component of the western leader is 51.7m long and orientated approximately east - west. The width varies from a consistent 1.6 - 2.0m band to a maximum of 5.3m occurring in a number of intermittent finger like extensions along the southern side. The post-stumps in the western leader begin 33.8m from the eastern end, 3.0m south of the main band of stones. These appear to form a double row, the outer, seaward line running 45.3m, and extending beyond the end of the stone spread, but running roughly parallel to it. Diameters of the stumps uncovered range from 3cm to 9cm, and further, more deeply buried posts may exist. The spacing between stumps averages 50cm, and the inner row, consisting of about 5 posts in a line, is ca 60cm north of the outer. Two metres from the eastern end of the stone spread,

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a small cutting, about 1.0m square revealed a mesh of branches and twigs along with one wood chip. Some of the branches had been chopped at the ends suggesting wood-working on site. No evidence of actual weaving could be identified, but this activity may represent repair work to a basket in the area. The current path of the stream is located about 50m east of the western wing. The eastern leader lies beyond it and runs approximately north-north-west to south-south-east for 63m, meandering a little, and curving round towards the south-west at its southern end. At the northern end a narrow line of stones can be traced for about 8.0m running into the stream. The stone spread ranges in width from 2.0 - 3.0m on average, to a maximum of 6.0m. It is irregular, being broken by several gaps probably due to erosion. At least 22 post-stumps were found to penetrate the stone spread.

The site **MRD 148:12** is identified as a linear feature which is a possible intertidal wall of uncertain date. The possible remains of an intertidal wall are situated on foreshore which is composed of small stones and pebbles with some larger stones and boulders scattered around. Between this and LWM is an extensive area of sand. The feature consists of a very rough spread of stones running approximately north - south for 30m. It is up to 5.9m wide in places, with a consistent core width of about 2.0m. One large stone measures 1.03m long, 22cm wide and 47cm high, but the average stone size is 30cm long, 23cm wide and 18cm high. Some of the stones, especially at the seaward end, are quite widely spaced. Although very ruinous and poorly-defined, the structure is definitely linear and lies in isolation from other stones and boulders forming part of the shoreline.

The site **MRD 148:15** is identified as wooden anti-aircraft landing poles of WWII date. They are situated on a flat, sandy foreshore at the northern end of Strangford Lough, near Newtownards. The defences consist of two parallel rows of small posts orientated northeast - southwest. They are not substantial posts and from their state of decay would not appear to be of very great antiquity. The posts are between 2.9m and 3.12m apart, on average, and measure about 4cm to 8cm in diameter. They protrude about 0.27m above the sand. The two rows lie about 4.07m apart. The eastern arm measures 80.5m in length at this location, terminating 20m from the sea defence wall. The western arm is 20.6m in length, ending 10m from a small stream flowing parallel to the sea defence wall. A total of 27 posts were noted in this location, and a further four further out in the mid intertidal zone. Similar posts were also recorded in the area of Corporation South (MRD 148:19). These would appear to be part of a World War II defence against aerial invasion and would probably have been strung with barbed wire.

The site **MRD 148:23** is identified as a reclamation bank of post-medieval date. It is described as a substantial reclamation bank, revetted with local greywacke stones and boulders, forms the northern edge of the lough and encloses a large area of mainly reclaimed land. The

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reclamation north of the embankment consists of rough, grass-covered land with patches of gorse and drainage channels, beyond which lie playing fields and industrial complexes. The embankment runs west-south-west for approximately 400m, then turns south-west, skirting an airfield. Various brick and concrete structures dating from World War II lie in this general area and several shelters are built into the northern side of the embankment. The bank stands 2.52m high on the northern side, and 3.01m high on the southern. The flat top measures 5.0m in width and a gravel path running along its centre is frequently used by local people. The southern face of the embankment is steep, and is revetted with generally large, machine-dumped boulders. At the base is firm sand with a few smaller stones close to HWM, beyond which is an expanse of generally stone-free sand. The embankment continues for some considerable distance south-west and would seem to have been altered and extended in recent years, as in places it does not conform to the lines shown on the 1933 OS map. The embankment at the northern end of the lough was originally completed in 1811, but has been altered in more recent times.

A review of the excavations database identified two archaeological investigations relevant to the proposed development site. Excavation AE/15/120E identified the remains of a former slate quarry recorded within the Industrial Heritage Records (IHR 2640). Excavation AE/16/58 identified archaeological deposits ranging from pre-historic to modern times. The development contained ten areas of archaeological significance. The earliest archaeological features were Early Bronze Age pits which were found in the southwest and northeast corners of the development and which dated to Cal 1885 to 1695 BC and Cal 2460 to 2205 BC respectively. Neither was associated with a burnt mound, though both were in close proximity to boggy areas. Small pits in Areas 1, 3 and 5; and the large (20m diameter) burnt mound in Area 10 were undated but were most likely of prehistoric date. The burnt mound was preserved in-situ on site as the current proposal did not require this area for development. A linear ditch in Area 2 was dated to Cal AD 1280 to 1390 and provided evidence for medieval occupation in this area. However, no further contemporary features were encountered. Early 19th century industrial activity was identified by quarrying in Areas 5, 6 and 7. Area 7 was a slate quarry pit noted on the 1st edition Ordnance Survey map and recorded as IHR 02640:000:00 on the sites and monuments record. The other two quarries had not previously been identified. The final feature was a late 18th century vernacular building in Area 9. The house was initially one large building 10m long and 5m wide, with 2 rooms. At a later date the central doorway was then blocked up, forming two separate houses, the southern being a single room, the northern being divided into two rooms. The house corresponded to the footprint on the 1st and 2nd edition Ordnance Survey maps.

14.3 Impact Prediction – Archaeological potential of the development site

The desktop survey has indicated that a single known archaeological site is located within the development area. This is site **DOW 06:17** which is recorded as the upstanding remains of a boundary wall associated with a dwelling shown on the early edition OS maps. The site is located within an area of green space within the master plan and will not be physically impacted upon by the proposed development. In addition, the desktop survey identified a further six dwellings/structures within the red line boundary of the development and which are shown on the early edition OS maps. Of these, three have upstanding remains. Under the proposed master plan layout, property 2, a complete 18th/19th century cottage will be located within an area of green space and will not be impacted upon. The remaining two properties (properties 1 and 3) will require demolition.

Looking beyond the development area, the desk top survey identified a number of known archaeological sites. Of particular relevance are a number of sites located to the immediate north of the proposed development and which were identified through archaeological investigations conducted as part of a residential development. These clearly indicate the potential for sub-surface archaeological remains to exist in this wider area and it is likely that such deposits will be located within the development site. Should such deposits exist then these could be negatively impacted upon by the proposed development and as a result further mitigation will be required.

14.4 Mitigation and Its Effectiveness

The desk top survey and site inspection indicate that the proposed development site is located in an area of archaeological potential, with the possibility that further archaeological or historical remains could exist sub-surface. In addition, the development area contains a number of upstanding buildings which appear to be shown on the early edition OS maps. On the basis of this it is recommended that prior to construction commencing an archaeological evaluation of the site be conducted.

A four-stage process would be required to facilitate this:

- Stage 1: Preparation of and submission of an archaeological programme of works for agreement with the local planning authority in consultation with DfC:HED. The programme should provide for the identification and evaluation of archaeological remains within the site, for mitigation of the impacts of development, through excavation recording or by preservation of remains, and for preparation of an

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archaeological report. The programme of works should also provide for the completion of a Level 3 building survey for the potential historic buildings at properties 1 and 3.

- Stage 2: Submission of an archaeological licence application to DfC:HED to undertake the proposed Stage 2 works.
- Stage 3: Excavation of targeted test trenches to identify and record any archaeological features, following agreement from DfC:HED within the programme of works.
- Stage 4: Upon completion of the on-site works a final monitoring report will be submitted to DfC:HED and to the local planning authority.

The archaeological programme of works should be prepared and submitted through the local Planning Authority at least 8 weeks prior to any construction works commencing on site. The archaeological licence may only be applied for once the programme of works has been approved. The licence should be applied for at least 2 weeks in advance of the required archaeological attendance.

14.5 Conclusion

It is proposed to develop an area of 41.05 hectares between Bowtown Road and Movilla Road, Newtownards (figure 1). The site is zoned in the Ards and Down Area Plan (ADAP) for housing under zoning NS 19, and includes the zoning NS 43, 7.32 hectares, which is open space zoning (figure 2). The minimum number of dwelling to be accommodated in the zoning is 675 and the maximum 844 but the development will be phased.

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immediate north of the proposed development and which were identified through archaeological investigations conducted as part of a residential development. These clearly indicate the potential for sub-surface archaeological remains to exist in this wider area and it is likely that such deposits will be located within the development site. Should such deposits exist then these could be negatively impacted upon by the proposed development and as a result further mitigation has been recommended.

Chapter 15: Climate assessment

15.1 Introduction

RPS has been commissioned by Pragma Planning and Development Consultants Ltd to undertake a climate assessment in relation to the proposed residential and mixed used development at Bowtown, Newtownards. The site currently consists of agricultural fields with a number of farm groups and individual dwellings mixed into the area. This chapter should be read in conjunction with Appendix 15.1 Climate Change Risk.

Site Location

The proposed development (see Figure A in Appendix 1 for indicative site boundary) is located on the eastern boundary of Newtownards. It is approx. 600 meters north of the shoreline of Strangford Lough, bound to the north by the B172 Movilla Road and to the south by the Bowtown Road. The western boundary of the site is in close proximity to the residential Abbot Drive area and the eastern boundary is open countryside.

Project Description

The proposed development will occupy a land area of just over 41 hectares. It will comprise 675 no dwellings. These will be a mix of apartments, town houses, semi-detached and detached houses. A mixed used High Street is proposed for the core of the development and this is intended to meet local needs in terms of convenience shopping, child care and related facilities. A local distributor road will run through the development connecting Bowtown Road to Movilla Road, the road is to accommodate a bus route. A pedestrian and cycleway network is also to be provided. The proposed development is located within the administrative area of Ards & North Down Borough Council.

15.2 Policy and Legislative Context

The Climate Change Act 2008 commits the UK government to reducing greenhouse gas emissions by at least 80% of 1990 levels by 2050 and created a framework for setting a series of interim national carbon budgets and plans for national adaptation to climate risks. The devolved administrations in Scotland, Wales and Northern Ireland are responsible for creating local climate change policy and contributing to the overall UK greenhouse gas emissions (GHG) reductions during each carbon budget period.

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Northern Ireland has requested advice from the UK Committee on Climate Change on whether it is advisable to implement a Northern Ireland Climate Change Act (In October 2015 the Northern Ireland Executive Minister asked the Committee on Climate Change (CCC) to provide an update on a CCC report produced in 2011 on the appropriateness of a Northern Ireland Climate Change Act) with GHG reduction target, following the examples of England, Scotland and Wales. This has not yet been undertaken; while there was a national action plan for carbon reduction and the 2011-2015 Programme for Government set a target of a 35% reduction by 2025 compared to a 1990 baseline, that target does not appear in the draft 2016 Programme for Government³.

In 2018 the Department of Agriculture, Environment and Rural Affairs (DAERA) requested further advice from the Committee on how Northern Ireland could reduce greenhouse gas emissions between now and 2030 and this advice has been published in February 2019⁴. Although not forming adopted policy, the advice on GHG reduction targets and broad policy trajectories, which is presented on a sectoral basis, provides a useful summary of the current position and context for future action and policy that will be required in Northern Ireland to contribute to GHG reduction commitments. Due to the nature of the proposed redevelopment, storage of fuels and oils a number of areas of carbon and climate policy are relevant.

Overall, the Committee recommends a target of 35% reduction in GHG emissions by 2030 from a 1990 baseline for Northern Ireland, consistent with the former Programme for Government target. In the electricity sector, the need to continue to increase renewable deployment and end the remaining reliance on Kilroot coal-fired power station is noted. Scenarios for the carbon intensity of electricity generation in Northern Ireland by 2027 of between 230 gCO₂/kWh and 100 gCO₂/kWh by 2030 are outlined, depending on the level of policy ambition. The current NI Strategic Energy Framework target is for 40% of electricity consumption to be met by renewable generation by 2030 and a new strategy for the period to 2050 is expected to be forthcoming.

Agriculture is the largest sectoral contributor to total GHG emissions in Northern Ireland and the carbon benefits of optimising fertiliser application, including potentially reducing synthetic fertiliser use, are noted in the Committee's recommendations for this sector.

Due to the limited gas grid in Northern Ireland (recent projects have expanded the gas network in NI for example SGN Gas to the West Project) there is a high reliance on off-grid heating, mainly oil-fired, which is a target area for GHG reductions. Combined heat and power (CHP) is strongly supported where individual heat-consuming processes or density of residential and other heat demands make it feasible.

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The main guidance used for assessment of GHG emissions in EIA is the IEMA guide 'Assessing Greenhouse Gas Emissions and Evaluating their Significance'. The guidelines summarise the need to set define the baseline and study boundaries, undertake a proportionate assessment (which may be quantitative or qualitative, depending on the scale of emissions, data availability and mitigation measures agreed), and contextualising emissions to evaluate significance.

The main data sources used in the assessment have been:

- The Northern Ireland Carbon Intensity Indicators, December 2018 (DAERA and NISRA), available <https://www.daerani.gov.uk/sites/default/files/publications/daera/northernireland-carbon-intensity-indicators-2018.xlsx> accessed 12 March 2019;
- The UK Government GHG Conversion Factors for Company Reporting, 2018 v1.01 (BEISandDefra),available <https://www.gov.uk/government/publications/greenhousegas-reporting-conversion-factors-2018> accessed 12 March 2019;
- The UKCP18 User Interface (Met Office Hadley Centre) and associated guidance and factsheets, available <https://ukclimateprojections-ui.metoffice.gov.uk/> March 2019; and,
- The Committee on Climate Change publication "Reducing emissions in Northern Ireland",February2019,available <https://www.theccc.org.uk/wpcontent/uploads/2019/02/Reducing-emissions-in-Northern-Ireland-CCC.pdf> accessed 05 March 2019.

15.3 Assessment Methodology

Assessment Criteria and Assessment of Significance

Assessment of GHG Emissions

In overview, GHG emissions have been estimated by applying published emissions factors to activities in the baseline and to those required for the proposed development. The emissions factors relate a given level of activity, a physical or chemical process, or amount of fuel, energy or materials used to the mass of GHGs released as a consequence.

The GHGs considered in this assessment are those in the 'Kyoto basket' of global warming gases expressed as their CO₂-equivalent global warming potential (GWP). This is denoted

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by CO₂e units in emissions factors and calculation results. GWPs used are typically the 100-year factors in the Intergovernmental Panel on Climate Change Fourth Assessment Report or as otherwise defined for national reporting under the United Nations Framework Convention on Climate Change (UNFCCC).

The majority of emissions from the proposed development are associated with the heating systems for the buildings (residential and non-residential). There are also emissions associated with the construction phase of the development.

GHG emissions arising due to the proposed development have been compared to emissions in the business-as-usual baseline in order to establish the net increase or decrease that is likely due to the proposed development's construction and operation.

The main emissions sources of the proposed development that have been considered are:

- Construction-stage impacts have also been screened to consider whether they may be significant relative to the operational (in-use) lifecycle stage,
- direct combustion emissions from the heating systems.

The approach to defining baseline conditions is discussed further below.

Assessment of Climate Risks

In order to consider the impact of the changing future climate upon the proposed development, probabilistic projections of change in climatic variables over time under several potential future global emissions scenarios published by the Met Office have been used. These projections have informed a high-level assessment of risks to the proposed development from climate change in the course of its lifetime, and potential design responses to adapt or increase resilience.

15.4 Significance of Effects

The significance of an effect is determined based on the magnitude of an impact and the sensitivity of the receptor affected by the impact of that magnitude.

The magnitude of impact on climate change can be quantified as mass of GHG emissions expressed as tCO₂e in total or per annum. The magnitude of impact from climate change can be quantified as the change in climatic parameters (e.g. °C change in temperature, % change in precipitation).

GHG emissions have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The global atmospheric

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concentration of the relevant GHGs, expressed in CO₂-equivalents, is therefore treated as a single receptor of high sensitivity (given the severe consequences of global climate change).

Climate change risk and resilience or adaptation measures do not lend themselves well to typical EIA significance matrices. A risk assessment has therefore been undertaken, considering the hazard, potential severity of effect on the development, probability of that effect, and level of influence the development design can have on the risk. The approach to this risk assessment is detailed in Appendix 15.1. A risk score of four or more (the minimum score where more than one element of the risk assessment is above 'low') has been defined as a risk that could lead to a significant effect of or on the development, prior to mitigation.

The Institute of Environmental Management and Assessment (IEMA) assessment guidance for GHG emissions referenced above indicates that in principle, any GHG emissions may be considered to be significant, and advocates as good practice that GHG emissions should always be reported at an appropriate, proportionate level of detail in an EIS. There are however no clear, generally-agreed thresholds or methods for evaluating the significance of GHG impacts in EIA. To aid in considering whether impacts are significant, the guidance referenced above recommends contextualising the magnitude of a development's GHG impacts, for example on a sectoral basis or compared to national carbon budgets.

The proposed development is not of a scale to have any material effect on the total UK carbon budget or Northern Ireland's contribution to that.

The magnitude of GHG emissions has therefore been set into context in the following ways:

- through comparison to the average carbon intensity of other sectors and previous years and future year predictions;
- through comparison to the baseline for sector use in transport; and
- with reference to whether the proposed development contributes to and is in line with policy and regulatory requirements for achieving the UK's national carbon budgets, which are consistent with science-based commitments to limit global climate change to an internationally-agreed level.

Taking these factors into account, the evaluation of significance of effects from GHG emissions is ultimately a matter of professional judgement, as it is not considered that a

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fixed numerical threshold can be defined that is applicable to the various elements of the proposed redevelopment.

Effects from GHG emissions are therefore described in this report as being adverse, neutral/negligible or beneficial based on the following definitions. Adverse or beneficial effects are considered to be significant, taking into account the IEMA guidance and the high sensitivity of the receptor. Neutral / negligible effects are not considered to be significant.

Adverse: the development's GHG impacts would be greater than a comparable baseline or below existing policy requirements or design standards.

Neutral or negligible: the development's GHG impacts would be consistent with the comparable baseline, existing policy requirements or design standards; or the impact is little or no net environmental change.

Beneficial: the development's GHG impacts would be substantially reduced relative to a comparable baseline and/or would include measures that go beyond existing policy or design standards.

For both GHG emissions and climate change risks, significance of potential effects has initially been stated prior to further mitigation, and then the significance of residual effects has been stated with implementation of any mitigation or enhancement measures. Table 14.2 may still be used to synchronise assessment of significance of impact even though the IEMA guidance dictates assessment protocol.

Table 15.1: Assessment of Significance Matrix (Simple)

Sensitivity	Magnitude of Impact			
	Negligible	Low	Medium	High
Negligible	Negligible	Negligible or minor	Negligible or minor	Minor
Low	Negligible or minor	Negligible or minor	Minor	Minor or moderate
Medium	Negligible or minor	Minor	Moderate	Moderate or major
High	Minor	Minor or moderate	Moderate or major	Major

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15.5 Baseline

The assessment site is located on lands located to the north of Bowtown Road (with Bowtown Road forming the southern boundary of the site) and to the south of Movilla Road (with Movilla Road forming the northern boundary of the site), Newtownards, Co Down. The lands within the assessment area are primarily agricultural lands, located on the periphery of the urban sprawl of Newtownards town, with residential developments located immediately adjacent to the north-western boundary of the site.

15.6 Impact Assessment

Assessment of Construction Effects

The proposed development's net total GHG emissions are likely to be dominated by its operational phase. Cost of producing building materials and constructing the development is usually determined to be embedded carbon (Embedded carbon as in "embedded carbon emissions" are the greenhouse gas emissions from the manufacturing of a product, in terms of CO₂ equivalent). However, this is difficult to quantify in detail at an early stage of design where full bills of quantities and materials for construction are not yet available in full.

A screening approach has therefore been taken to consider whether construction-stage GHG emissions could be material to the total impact of the proposed development and the significance of effects. Materiality is a term used in greenhouse gas accounting to distinguish minor and major emission sources for a proportionate assessment, with non-material or de minimis sources being those that are unlikely to appreciably affect the total or are likely to be within its uncertainty range. A materiality threshold of 5% of total emissions is commonly used and has been adopted in this assessment.

Life cycle assessment (LCA) is a method used for measuring the comprehensive environmental effects of objects and actions. Besides the direct environmental effects, LCA also measures the indirect effects beginning at the acquisition of raw materials and ending at the disposal of the product. In previous research, LCA has been the tool for measuring and comparing the environmental effects of different material and product options, building types, energy options etc. In addition, LCA has quite recently been used more and more to study the activities in society that cause carbon emissions and the relative shares of these activities. Some of the previous research has focused on comparing the different LCA methods and their applicability in various conditions.

There are relatively few life-cycle assessment (LCA) studies of major housing developments in a Northern Ireland, Republic of Ireland or UK context. Studies reviewed do suggest that construction-stage GHG emissions form a minor proportion of total lifecycle emissions or indeed exclude construction from the study boundary, but do not provide clear evidence that construction-stage emissions would be below the 5% materiality threshold of total lifecycle emissions.

While the LCA method has previously been utilized in construction research, gaps in the knowledge related to the emissions of construction can still be identified. Several studies concerning life cycle wide environmental loads of the specific construction materials

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exist. In addition, the GHG emissions from construction of different building types have been studied. However, few studies with life cycle perspective on environmental effects of whole residential areas exist. Besides the construction of residential buildings, the constructions of communal buildings and infrastructure also have significant impact on the carbon footprint of a typical residential area.

Embodied carbon factors (and emission estimates) for concrete and 'average' construction materials published by Department for Business, Energy & Industrial Strategy (BEIS). Overall these estimation approaches suggest that construction-stage GHG emissions cannot conclusively be screened as non-material to the proposed development's total lifetime GHG emissions but are likely to be minor relative to operational-stage impacts. Therefore, an adverse impact during construction (including demolition) is predicted, prior to mitigation. Traffic movements associated with the construction (including demolition) are not long term and only apply during the construction timeframe of the proposed development.

With regard to climate change risks to the proposed development during the construction period, Appendix 15.1 summarises potential changes in climatic parameters from 2020 onwards. Changes are likely to occur gradually and are not likely to be large within the timescale for construction. It is considered reasonable that construction contractors would be able to adapt working methods if necessary. For example, warmer winter conditions may extend the time certain construction activities such as concrete pouring can be carried out, while a greater chance of summer heatwave conditions may require adaptations such as shading work areas or increased attention to construction dust control measures. Effects are considered to be negligible and not significant.

Assessment of Operational Effects

The key objective of the development is to create housing and associated infrastructure. The following main sources of emissions are detailed in this section.

Road Vehicles

It is unlikely that much net additional road transport mileage with associated GHG emissions would be caused compared to the business-as-usual baseline. It is also likely that road transport will decarbonise in future and transport-related GHG emissions may in fact be lower.

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Regular Maintenance

Regular maintenance and inspections of items such as product tanks, equipment, mechanical & electrical systems, components, etc. will be part of operations, which will be scheduled within the terminals inspection/maintenance system(s) such as a Planned Plant Maintenance (PPM) system, using industry/ manufacturers recommendations. The level of traffic associated with maintenance is not significant and would not give rise to significant amounts of emissions.

Building Heating

With regard to the process energy demands of the proposed development itself, the buildings will be heated using natural gas. In relation to emissions these are not significant in terms of GHG emission (specifically carbon dioxide). Process energy demands in terms of GHGs are therefore not significant to the assessment. The types of boiler proposed is governed by legislation in relation to emissions and these are not significant in terms of GHG emission. Details of the proposed boilers for a typical house in the proposed development known at this stage are set out below:

- Fuel for main heating system - Mains gas
- Dwelling Carbon Dioxide Emission Rate (DER) 14.36 kg/m²
- Main Heating system - Boiler system with radiators
- Efficiency 89.3 %
- Minimum 88.0 %
- Secondary heating system: None

Table 15.2 below shows design calculations for the typical housing types proposed for carbon dioxide emissions.

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Table 15.2: Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating (main system 1)	(211) x	0.198	638.96 (261)
Space heating (secondary)	(215) x	0	0 (263)
Water heating	(219) x	0.198	575.4 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1214.36 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.517	261.74 (267)
Electricity for lighting	(232) x	0.517	243.39 (268)
Total CO₂, kg/year		sum of (265)...(271) =	1719.5 (272)

General UK Energy Consumption Forecasts

Changes in energy consumption impact the use of resources in the production, transportation, and final supply and use of energy. Future energy market modelling is complex and beyond the scope of this assessment. Reference can be made to energy use predictions by Department for Business, Energy & Industrial Strategy (BEIS). BEIS has undertaken such modelling and publishes projected consumption. The GHG emissions associated with the use of energy may be estimated by applying a fuel-specific emissions factor. By multiplying the energy use (measured in kWh) by an emissions factor (measured in kgCO₂e/kWh), one obtains the quantity of GHG emissions produced, measured in terms of the equivalent mass of carbon dioxide emissions (kgCO₂e).

Each year BEIS publishes updated energy projections (UEPs), analysing and projecting future energy use and greenhouse gas emissions in the UK. The projections are based on assumptions of future economic growth, fossil fuel prices, electricity generation costs, UK population and other key variables regularly updated. They also give an indication of the impact of the uncertainty around some of these input assumptions. Each set of projections takes account of climate change policies where funding has been agreed and where decisions on policy design are sufficiently advanced to allow robust estimates of policy impacts to be made.

Total final energy demand is projected to fall until 2025: from 139 Mtoe (million tonnes of oil equivalent) in 2017 to 135 Mtoe in 2025, a 3% decline. It is then projected to increase steadily, reaching 141 Mtoe in 2035. This is 1% higher than in 2017. Transport is the largest consumer on a final energy basis, accounting for 40% of final energy demand in 2017 if international aviation is included. This share is projected to fall to 37% by 2035. Around 97% of 2017 transport final energy consumption was from oil-based fossil fuels but by 2035 this is projected to fall to 93% due to uptake of electric vehicles and increased use of biofuels.

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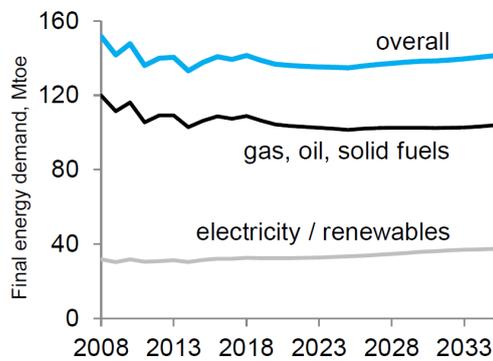
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The domestic (residential) sector accounted for 29% of final energy consumption in 2017; this rises to 34% in 2035. In the domestic sector the drivers of projected demand are projected numbers of households, retail fuel prices and the weather.

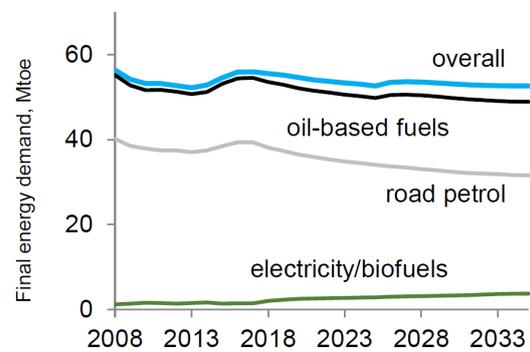
Figure 15.1: shows Final energy demand by fuel and consumer sector 2008 to 2035 published from BEIS in May 2019.

Figure 15.1: Final energy demand by fuel and consumer sector 2008 to 2035 (BEIS, 2019)

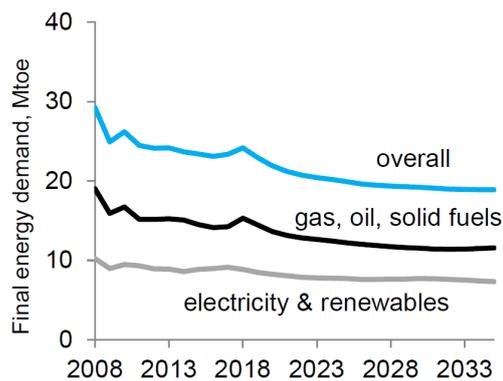
a) Total demand, broken down by fuel



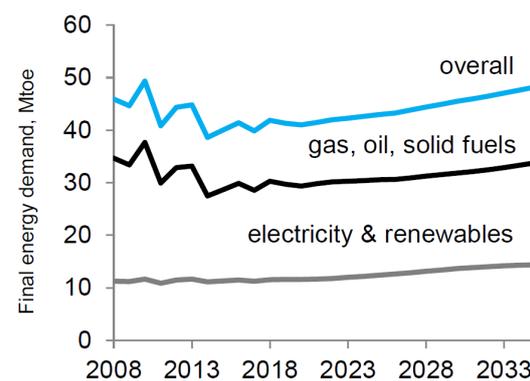
b) Demand in transport



c) Demand in industry



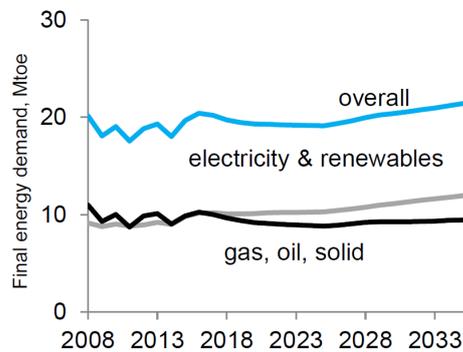
d) Demand in domestic sector (households)



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e) Demand in services sector (including agriculture)



The industrial sector accounted for 17% of total final energy in 2017. Demand is projected to be around 5% per year lower than in the 2017 projections due to higher projected energy prices. In these projections, industrial energy demand is projected to fall by 19% overall between 2017 and 2035. Renewables are projected to meet 6% of industrial energy demand in 2035 compared with 5% in 2017.

Overall

Overall, taking into account the GHG emissions and predictions described above the net operational effect of the proposed development is considered to be negligible and not significant. .

Potential climate change risks to the proposed development and any resilience or adaptation measures have been assessed in Appendix 15.1. The risk assessment concludes that, with incorporated mitigation measures, no significant climate change risks to the development other than flooding are considered likely and no significant effect is predicted. Flood risk and appropriate mitigation are detailed further in the relevant chapter of the Environmental Impact Statement.

Assessment of Cumulative Effects

As set out in the IEMA guidance, any proposed development has the potential in principle to result in adverse or beneficial effects on climate change that could be significant, and this may include other consented or planned developments in the area of the proposed redevelopment. The reason for this is that climate change is a global effect, not an impact that is localised in the area around any one individual development or group of developments, so all projects have the potential to contribute cumulatively to the effect.

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For this reason, the sensitivity of the receptor (atmospheric greenhouse gas concentrations) has been defined as 'high' for the assessment in this chapter, taking into account the cumulative contribution to climate change of other projects and anthropogenic activities. The significance of cumulative effects has therefore already been considered in the assessment in this chapter.

The type of effects and suitable measures to mitigate these from other developments would need to be dealt with for each application as it comes forward, to ensure that the effects on climate change are reduced as far as possible.

Inter-relationships

There are two main areas of potential inter-related effects between climate change and other EIS topic areas.

The first is flood risk, where future climate changes may increase the probability or intensity of high-rainfall events or increase coastal flooding risk. Flood risk including climate change allowances has been assessed in Chapter 11 Drainage of the Environmental Impact Statement.

Secondly, there could be potential for climate changes to affect the potential for impact, the future baseline circumstances, the sensitivity or vulnerability of receptors or the mitigation recommendations for other EIS topics. Potentially relevant areas are ecology, landscape planting, air quality and odour, accidents and disasters and health and wellbeing. Further detail is given in Appendix 15.1 and the climate projections summarised in that appendix have been provided to the relevant EIS topic authors in order that inter-related effects can be assessed if they are found to be relevant in the case of the proposed development.

15.7 Mitigation Measures

Construction

The initial screening assessment of construction-stage GHG emissions has suggested that the embodied carbon in construction materials used may be significant, depending on exact materials quantities required in the detailed design. The following further mitigation is therefore recommended.

During detailed design, seek to reduce embodied carbon by:

- identifying potential carbon 'hotspots', materials or design elements with high embodied carbon either due to quantity or manufacturing process;
- seeking to reduce embodied carbon with product substitution or using materials with high recycled content – guided by Environmental Product Declarations or BRE Green Guide ratings A+/A where available; and
- setting an overall target for lean design and carbon reduction.

During construction, minimise wastage, plant- and transport-related GHG emissions by:

- Implementing a Site Waste Management Plan (SWMP) with targets to minimise material wastage and maximise recycling of remaining construction waste;
- Ensure all vehicles switch off engines when stationary and not in immediate use - no idling vehicles (emissions to air controlled);
- All plant utilised will be regularly inspected (emissions to air controlled);
- Visual monitoring of plant will include: Ensuring no black smoke is emitted other than during ignition (emissions to air controlled); and
- Ensuring exhaust emissions are maintained to comply with the appropriate manufacturers limits (emissions to air controlled).
- Using modern, well-maintained construction plant with higher fuel efficiency; and
- Procuring products locally where possible to reduce transport distance.

15.8 Statement of Significance of Residual Effects

Construction

An adverse effect of the proposed development on climate change that is significant during construction due to the embodied carbon of materials used is predicted.

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However, the magnitude of adverse impact during construction and its impact would only be temporary. No significant effect of climate change on the proposed development during construction is predicted.

Operation

The effect on climate change during operation would be not be significant given the type of natural gas units proposed to be used. No significant effect impact of climate change on the proposed development in operation is predicted.

15.9 References

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BEIS and Defra, 2018: UK Government GHG Conversion Factors for Company Reporting v1.01, available: <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019>.

Chapter 16: Interactions

16.1 Introduction

Schedule 4 part 5 of the EIA Regulations requires that in addition to assessing impacts on human beings, fauna, flora, soil, water, air, climate, landscape, material assets and cultural heritage, the interrelationship between these factors must be taken into account as part of the environmental impact assessment process.

Accordingly, as part of their assessments all of the expert consultants were asked to consider the interrelationships between the aspect they were reviewing, and the other aspects of the environment affected by the development proposal.

16.2 Interactions

Table 16.1 below is a matrix table indicating the significant interactions that are likely to occur between the various aspects affected by the development proposal. The table cells are colour coded to highlight the relationships that exist between the aspects, where a table cell is green this indicates that a relationship exists between the two environmental areas. The purpose of the table is to allow interaction between various disciplines to be recognised, although the level of interaction will vary in each case. It is assumed in presenting this table that an environmental discipline has a potential inter-relationship both during the construction and operational phases of the scheme. A summary of expected interactions is given in Table 16.2.

Table 16.1

Aspects ¹	Bio- diversity	Land, Soils and Water	Population	Air	Transportation	Drainage	Noise	Landscape and Visual	Archaeology	Climate Change
Bio- diversity										
Land Soils and Water										
Population										
Air										
Transportation										
Drainage										
Noise										
Landscape and Visual										
Archaeology										
Climate Change										

¹ The aspect of human health is considered under noise and air quality

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Table 16.2 Summary of Interactions

Aspect	Interaction with	Interaction
Biodiversity	Land, Soils, Water	<p>Pollution of water bodies and watercourses can affect biodiversity, in this case the site is hydrologically linked to a number of internationally important protected sites.</p> <p>In the construction phase pollution potential is a result of interaction between the land-shaping exercise and water (via drainage) as a conveyor.</p> <p>Drainage design (see below) has been undertaken to reduce the impact on these sensitive habitat areas.</p> <p>In the construction phase early installation of the drainage system will prevent contamination of water bodies and watercourses from surface water run-off.</p> <p>The development is proposed to be phased with the phasing reducing the effects of surface water run-off following vegetation removal.</p> <p>During construction a series of measures are proposed to prevent pollution of waterbodies in accordance with best practice.</p> <p>In the operational phase the drainage system will reduce impact to a de-minimis level through the throttle effect of the hydrobrake.</p> <p>No residual impacts are predicted</p>
	Air	<p>In the construction phase air effects from plant and equipment use at the site are reduced to de minimis levels through site management.</p> <p>In the operational phase air effects arise as a result of increased traffic from the development site; however, none of these are predicted to breach Air Quality Objectives and consequently no mitigation measures are required.</p> <p>Consequently, no additional impacts on biodiversity were identified.</p> <p>No residual impacts are predicted.</p>

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Aspect	Interaction with	Interaction
Biodiversity	Drainage	<p>Drainage proposals will be implemented at an early stage, i.e. within phase 1. The stormwater proposals consist of extended on site storage, in oversized pipes, for storm water flows with a hydrobrake to attenuate water emissions to green field run-off rates.</p> <p>Foul drainage will be conveyed from the site to the Waste Water Treatment Works at Ballyrickard. The foul drainage system has been designed to accommodate NS20 as well as NS19. Within NS19 a series of local pumping stations are required as a result of site levels, these will connect to a new mains sewer in the link road.</p> <p>Implementation within the construction phase will prevent significant impacts on the water environment as in the operational phase.</p> <p>No residual impacts are predicted.</p>
Land, Soils, Water	Biodiversity Drainage	<p>The development site is hydrologically linked to a number of internationally protected sites. Exposure of soils during the construction phase could in the absence of mitigation result in the transmission of soil particles to these protected sites.</p> <p>Site drainage proposals address this potential impact through early construction of the attenuated drainage system on site during the first phase and site management through the adoption of a construction management plan.</p> <p>The drainage proposals also address the operational phase.</p> <p>No residual impacts are predicted.</p>

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Aspect	Interaction with	Interaction
Land, Soils, Water	Landscape Archaeology	<p>Land-shaping activity exposes buried archaeology and alters the shape of the landscape.</p> <p>Landscape and visual impacts of the proposal include the physical changes in topography envisioned in the proposals. While land-shaping results in permanent changes in landscape character distinctive landscape elements are retained within the proposals and the effects are considered to be off-set by the extensive landscaping proposed as a result of the development.</p> <p>Archaeological research indicates that there are no known archaeological sites within the site boundary. However, unknown sites may still be present; if present these would be uncovered by land-shaping. Archaeological mitigation measures off-set impacts by identifying and recording archaeological sites in advance of development, and provide for amendment to the scheme should a site of significance be uncovered.</p> <p>Effects on the settings of archaeological sites and monuments within the vicinity of the site from the development have been considered in accordance with the importance/value of the monument. No significant effects have been predicted.</p> <p>No residual impacts are predicted.</p>

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Aspect	Interaction with	Interaction
Population	Transport Drainage	<p>Increased use of and requirement for infrastructure is an element of the Socio-Economic Impact Assessment and is a direct result of increased population in the area.</p> <p>The effects on transport and drainage from increased population relate to increased traffic (in the form of all transport trips) and increased storm and foul sewage flows. The proposal includes provision of infrastructure to address these effects in full.</p> <p>There are linked secondary interactions with biodiversity and land, soils and water; these have been detailed above.</p> <p>No residual impacts are predicted.</p>
Transportation	Noise	<p>Increased transportation movements arising from the development relate to increased noise and effects on air quality.</p> <p>The noise assessment reflects these increases in its analysis and proposes mitigation measure to avoid, reduce, prevent or offset effects including the erection of noise attenuating fencing on the site boundaries in the operational phase.</p> <p>In the construction phase, site traffic and related noise effects are identified and mitigation proposed.</p> <p>The assessment also addresses cumulative impacts with other developments in the area.</p> <p>No residual impacts are predicted.</p>
	Air	<p>The analysis of air quality is also linked to the effects of increased traffic and the assessment allows for the increased levels of traffic arising from the completed development; it also includes cumulative effects.</p> <p>In the operational phase the air quality objectives are not exceeded, and no mitigation is required.</p> <p>In the construction phase, additional transport movements do not increase pollutant levels above the air quality objectives.</p> <p>No residual impacts are predicted.</p>

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Aspect	Interaction with	Interaction
Drainage	Biodiversity Water	Linkages between drainage, biodiversity and water are described above.
Noise	Transportation	Linkages between transport and noise are described above.
Landscape and Visual	Archaeological Land, Soils, Water	<p>No monuments or archaeological features have been identified within the site. Consequently, no direct or indirect visual or other effects on monuments or archaeological features or their settings are predicted.</p> <p>All other scheduled monuments are distant enough from the Application Site to be subject to any significant changes to their landscape and visual setting.</p> <p>No residual impacts are predicted.</p> <p>Lands, Soils and Water interactions are described above.</p>
Cultural Heritage	Landscape and Visual Land, Soils, Water	Linkages between landscape and visual aspects and archaeology / cultural heritage are described above.
Climate Change	Air Transportation Drainage	<p>The interlinkages between Air, Transportation and Climate Change as a result of space heating, other operational sources (such as maintenance), and transportation are considered in the Climate Change Chapter.</p> <p>Effects of climate change on drainage are factored into the drainage design as a matter of course.</p> <p>No residual impacts are predicted.</p>

16.3 Conclusions

Impacts of the proposal on the aspects listed in Table 13.2 have been assessed fully in the individual Chapters, of this EIS. No significant environmental impacts are predicted as a result of interactions - other than those that have been assessed within the individual chapters.

Chapter 17 Measures to Avoid, Reduce, Prevent or Offset Significant Environmental Effects - Mitigation

17.1 Introduction

The preceding chapters provide information on the nature of the development proposal and identify the potential significant adverse environmental effects. The mitigation of significant adverse environmental effects is in four forms:

- Avoidance;
- Prevention;
- Reduction; and
- Off setting of significant adverse environmental effects

Mitigation has been defined as: -

“not taking certain actions; limiting the proposed action and its implementation; repairing, rehabilitating or restoring the affected environment; presentation and maintenance actions during the life of the action; and replacing or providing substitute resources or environments.”¹

Guidance on mitigation has been provided by the Department of Environment in London. This is set out below: -

“Where significant effects are identified, (describe) the measures to be taken to avoid, reduce or remedy those effects: -

- (a) Site Planning
- (b) Technical Measures, e.g.:
 - (i) Process selection
 - (ii) Recycling
 - (iii) Pollution control and treatment
 - (iv) Containment (e.g. bunding of storage vessels)
- (c) Aesthetic and ecological measures, e.g.:

¹ US Council on Environmental Quality

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- (i) *Mounding*
- (ii) *Design, colour etc.*
- (iii) *Landscaping*
- (iv) *Tree plantings*
- (v) *Measure to preserve particular habitats or create alternative habitats*
- (vi) *Recording of archaeological sites*
- (vii) *Measures to safeguard historic buildings or sites*

(Assess) the likely effectiveness of mitigating measures" ²

The guidance does not spell out all the types of mitigation. Normal approaches involve firstly investigating whether the impact can be avoided. Where this is not possible, methods to prevent or reduce the impact are employed and these can include for example, the sensitive design of structures, and/or scheduling of activities as environmentally appropriate.

Furthermore, it is possible to repair, rehabilitate or restore aspects that have been temporarily lost or damaged; for example, the restoration of land following construction activity and removal of temporary site roads and compounds.

Finally, it is possible to compensate for environmental impacts, for example wildlife habitats.

DETR research carried out in 1997 resulted in the publication of a draft good practice guide, this introduced the concept of a mitigation hierarchy³, which is as follows: -

- Avoid impacts at source
- Reduce impacts at source
- Abate impacts on site
- Abate impacts at receptor
- Repair impacts
- Compensate in kind

² DOE 1989 Reproduced from *Introduction to Environmental Assessment* Glasson Therivel and Chadwick pg 153

³ Mitchell J "Mitigation in Environmental Assessment – Furthering Best Practice." Environmental Assessment, December 1997

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- Compensate by other means
- Enhance

The mitigation measures were provided on the basis of the hierarchy above.

17.2 Comprehensiveness

Mitigation measures were planned and carried out in a co-ordinated manner to ensure that they would be effective and would not conflict with each other.

The sections that follow outline the main mitigation measures as described in previous chapters and ensure that any conflicts are removed through an integrated approach. A programme of measures, phased as necessary, is then put forward.

These sections summarise the mitigation, for exact details of mitigation measures each chapter should be consulted.

17.3 Mitigation

Mitigation is not limited to one point in the assessment and is inherent in all aspects of the design process. While the design of the development is in outline form and is currently only conceptual that design has evolved through the assessment process in response to environmental matters being highlighted.

Throughout the design team worked closely with the environmental assessors to address matters arising from the assessment. Accordingly, the final design that has come forward avoids directly affecting identified habitats and features of the land and seeks to integrate these into the overall scheme.

The appraisal of impacts carried out by the consultants as part of the process drew two types of conclusion: -

1. Certain aspects had their mitigation measures implemented as a result of the commencement of development and no further work was required.
2. In respect of the remaining aspects, it was concluded that there would be no significant alterations in approach, conclusions or proposed mitigation measures.

Accordingly, and for completeness, Table 17.1 below contains information relating to the mitigation measures proposed for the whole development as previously detailed in this Environmental Statement.

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14.4 Measures Arising from the EIA Process

Measures Proposed

The effects that were identified in the process and the measures proposed to reduce, prevent or offset those effects are contained in Table 17.1 below.

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Table 17.1: Summary of Impacts and Proposed Mitigation

Human Environment	Impact	Mitigation	Status	Residual Impacts
Visual Impact	<ul style="list-style-type: none"> Alteration of the land during construction phase Changes to landscape character from increased urbanisation Localised and town wide effects are not considered significant Development is not prominent 	<ul style="list-style-type: none"> Retention of natural site features including trees, boundary hedgerows and water course Buffer planting of 10 metres depth on boundaries of the development 	Included in proposed development design	No residual impact identified
Noise	<ul style="list-style-type: none"> Construction noise primarily during daytime hours Traffic noise post completion Operational phase plant and equipment 	<ul style="list-style-type: none"> Restrictions on timing of construction works. Use of modern plant maintained in accordance with BS5228:2009. Provision of fencing to boundaries with existing housing. Screening to and location of fixed plant away from residential boundaries. Construction Environmental Management Plan is to be issued to the main contractor. Non opening glazing Mechanical ventilation Acoustic barriers Enclosures and screening Plant selection Silencers Internal locations where possible 	<p>To be implemented at construction stage</p> <p>To be implemented at construction stage</p> <p>To be implemented at construction stage</p>	<p>Temporary minor adverse in the construction phase</p> <p>Negligible in the operational phase</p> <p>Negligible in the operational phase</p>

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Human Environment	Impact	Mitigation	Status	Residual Impacts
Transport	<ul style="list-style-type: none"> Impact of development generated traffic on local transportation Sustainable transport measures 	<ul style="list-style-type: none"> Congestion alleviation - Movilla Road/ Donaghadee Road junction works Public transport and pedestrian/cycling measures Residential Travel Plan and Service Management Plan proposed 	To be implemented during construction and prior to occupation of dwellings at the development site	Residual impact not predicted
Archaeology	<ul style="list-style-type: none"> Surviving unknown sub-surface archaeological deposits may exist within development site 	<ul style="list-style-type: none"> Proposed archaeological programme of works with watching brief. 	Programme of works to be agreed with Council/HED prior to commencing development and implemented during construction	Residual impacts not predicted

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Human Environment	Impact	Mitigation	Status	Residual Impacts
Air Quality	<ul style="list-style-type: none"> Construction phase effects from dust and reduced air quality at adjoining residential properties. 	<ul style="list-style-type: none"> Stakeholder Communications Plan Responsible person appointed and position advertised Dust Management Plan prepared as part of CEMP Staff training Record of complaints and exceptional incidences Twice weekly site inspection and recording Install barriers and screens Maintain adequate water supply for dust suppression and to clean surfaces Store dust generating materials in enclosed containers Monitoring and regular inspection of vehicles and plant 	<p>CEMP to be finalised with main contractor prior to commencing development. To include DMP and SCP</p> <p>Other measures to be implemented during construction</p>	Negligible residual impact predicted

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Natural Environment	Impact	Mitigation	Status	Residual Impacts
Soils, Water	<ul style="list-style-type: none"> Impact on Surface Waters from construction phase activities 	<ul style="list-style-type: none"> Preparation of CEMP Physical measures preventing contamination incorporated into the CEMP Timing of construction activities Physical works to remediate contamination hotspot 	<p>CEMP to be finalised with main contractor</p> <p>Physical measures and timing to be implemented during construction</p>	Negligible to minor residual impacts predicted
Biodiversity	<p>1) Habitat</p> <ul style="list-style-type: none"> Loss of priority habitat types on site Loss of on-site habitats Potential effects from run-off from conversion to hardstanding and related impacts on International protected sites arising from hydrological link <p>2) Protected Species</p> <ul style="list-style-type: none"> Loss of bat roosting location(s) Reduction in bat foraging habitat/opportunities Disturbance of bats and badgers through noise and artificial lighting Loss of breeding bird habitat and loss of bird roosting and foraging grounds 	<ul style="list-style-type: none"> Creation of new native woodlands Retention of tree groups and identified hedgerows Enhancement of retained hedgerows through additional native planting Retention of trees Buffer zones around badger setts Avoid play areas located adjacent to badger setts in final design Native species landscape planting Protection of watercourses CEMP Artificial bat roosts to be provided Lighting design to minimise light spillage in key locations Avoid disturbance of breeding birds Ecological Clerk of Works to be appointed 	<p>To be implemented during construction</p> <p>Implement during construction phase</p> <p>Operational phase management and monitoring</p>	<p>No significant residual effects on habitats</p> <p>Significant minor adverse effect on bats and badgers</p> <p>No significant effect on birds</p>

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Natural Environment	Impact	Mitigation	Status	Residual Impacts
Drainage	<ul style="list-style-type: none">Increased surface water runoffRelated direct and indirect impacts on flooding at the site and on downstream ecology	<ul style="list-style-type: none">Attenuation of site drainage to existing green field runoff levelConstruction management measures	To be implemented during construction	Neutral

17.5 Mitigation Programme

Introduction

In order to ensure none of the elements contained in the mitigation above are in conflict with any other element a mitigation programme has been compiled. This sets out the actions at the various stages of the project, from detail design to operation. The programme enables conditioning of any planning approval in an appropriate and correct order. Three broad types of mitigation interventions are envisioned in the lifecycle of the development; these are: -

1. Pre-construction phase design and evaluation (prevention and reduction measures)
2. Construction phase management and physical/compensation mitigation (reduction and offsetting measures)
3. Operational phase management and monitoring mitigation

Ideally the programme of activities laid out below would be implemented in series with each phase complete before the subsequent phase begins, however it is recognised that in practice a number of actions can take place together, therefore the programme anticipates some overlap between phases. In addition, the site will be constructed in a series of phased developments over a 10-year period; the measures below are applicable for each phase as detailed in Chapter 2 and in accordance with the phasing plan in Appendix 2.

Pre-Construction Phase

Before site works or construction commence a number of activities must be undertaken to ensure that the impact of the development is minimised; these are: -

- Reserved matters consent must be obtained, this is likely to be done on a phase by phase basis or in smaller sub-phases depending on the land owner making the application for consent;
- Finalise the route for the pumping main between NS19 and the Portaferry Road NI Water pumping station – this will include Environmental Assessment and

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relevant statutory approvals to be completed prior to commencement of development at NS19;

- A phased programme of archaeological mitigation must be provided and agreed;
- Details of off-site road works are to be provided;
- Submission and agreement of a Travel Plan for the development;
- Erection of fencing to protect retained trees, watercourses and other sensitive areas, including badger setts;
- Creation of buffer zone areas around and alongside water courses, with attendant silt control;
- Erection of fencing around the site under development to avoid noise and air quality impacts; and
- Choice of modern maintained plant to reduce noise and air quality impacts

Construction Phase

In the construction phase a number of key physical and management interventions are proposed; they are set out below on a phase by phase basis, these are also applicable to any sub-phase: -

Phase 1: -

- Completion of the Bowtown Road roundabout and first stage of link road;
- Upgrading works to the culverted Bowtown Stream;
- Mains sewer within road bed (see overlapping works below) and construction of pumping station;
- Connection of existing dwellings to link road first stage;
- Site fencing around the phase and fencing around retained trees and other sensitive locations with temporary personnel access restrictions;
- Buffer zone creation and related fencing with temporary silt curtains introduced with fencing;
- Archaeological investigation;
- Construction of temporary site compound;
- Backfilled trenches around temporary buildings to act as soakaways;

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- Haul routes;
- Surface water measures, including temporary drainage, settlement ponds and soakaways;
- Bunded fuel storage and vehicle servicing areas;
- Contained, covered concrete storage areas;
- Installation of wheel wash and use of mobile bowser;
- Topsoil containment areas to be created;
- Topsoil strip, monitoring and storage on site;
- Introduce surface water drainage as proposed with attenuated flows using a hydrobrake;
- Housing access creation;
- Dust monitoring;
- Permanent fencing and landscape buffers between development and existing housing;
- Creation of open space within phase 1, including the southern gateway open space, play areas and the southern stage of the greenway route along the old Ballyreagh Road;
- Street tree planting and ecological enhancement measures; and
- Validation sound level monitoring on road frontages

Overlapping works between Phase 1 and Phase 2

- Construction of mains sewer between Bowtown Road and Movilla Road within the bed of the link road – including construction of the road bed through the NS19 zoning; and
- Construction of the pumping station and pumping main connecting NS19 to the NI Water pumping station at Portaferry Road

Phase 2: -

- Completion of the Movilla Road roundabout and second stage of link road;
- Mains sewer connection within road bed (see overlapping works above);
- Connection of existing dwellings to link road second stage;

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- Site fencing around the phase and fencing around retained trees and other sensitive locations with temporary personnel access restrictions;
- Buffer zone creation and related fencing with temporary silt curtains introduced with fencing;
- Archaeological investigation;
- Construction of temporary site compound;
- Backfilled trenches around temporary buildings to act as soakaways;
- Haul routes;
- Surface water measures, including temporary drainage, settlement ponds and soakaways;
- Contained, covered concrete storage areas;
- Installation of wheel wash and use of mobile bowser;
- Topsoil containment areas to be created;
- Topsoil strip, monitoring and storage on site;
- Introduce surface water drainage as proposed with attenuated flows using a hydrobrake;
- Housing access creation;
- Dust monitoring;
- Permanent fencing and landscape buffers between development and existing housing;
- Creation of open space within phase 2, including play areas and the northern stage of the greenway route along the old Ballyreagh Road;
- Street tree planting and ecological enhancement measures; and
- Validation sound level monitoring on road frontages

Phase 3: -

- Completion of the third stage of link road – this will complete the whole road;
- Connection of remaining existing dwellings to link road;
- Site fencing around the phase and fencing around retained trees and other sensitive locations with temporary personnel access restrictions;

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- Buffer zone creation and related fencing with temporary silt curtains introduced with fencing;
- Archaeological investigation;
- Construction of temporary site compound;
- Backfilled trenches around temporary buildings to act as soakaways;
- Haul routes;
- Surface water measures, including temporary drainage, settlement ponds and soakaways;
- Contained, covered concrete storage areas;
- Installation of wheel wash and use of mobile bowser;
- Topsoil containment areas to be created;
- Topsoil strip, monitoring and storage on site;
- Introduce surface water drainage as proposed with attenuated flows using a hydrobrake;
- Housing access creation;
- Dust monitoring;
- Permanent fencing and landscape buffers between development and existing housing;
- Creation of open space within phase 3, including the town park;
- Street tree planting and erection of bat boxes; and
- Validation sound level monitoring on road frontages

Phase 4: -

- Site fencing around the phase and fencing around retained trees and other sensitive locations with temporary personnel access restrictions;
- Buffer zone creation and related fencing with temporary silt curtains introduced with fencing;
- Archaeological investigation;
- Construction of temporary site compound;
- Backfilled trenches around temporary buildings to act as soakaways;
- Haul routes;

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- Surface water measures, including temporary drainage, settlement ponds and soakaways;
- Contained, covered concrete storage areas;
- Installation of wheel wash and use of mobile bowser;
- Topsoil containment areas to be created;
- Topsoil strip, monitoring and storage on site;
- Introduce surface water drainage as proposed with attenuated flows using a hydrobrake;
- Housing access creation;
- Dust monitoring;
- Permanent fencing and landscape buffers between development and existing housing;
- Creation of open space within phase 4, including play areas and planting of buffer areas along watercourses;
- Street tree planting and ecological enhancement measures; and
- Validation sound level monitoring on road frontages

Operational Phase

As the development is to be occupied in phases, there will be overlap between construction and operational phases. Activities in the operational phase are concerned with management and monitoring of the mitigation actions; they are: -

- Management and maintenance of public open spaces by a fully constituted residents association with management responsibilities and including: -
 - Cutting regimes for different habitat types;
 - Controls on the use of fertiliser, pesticide and herbicide;
- Transfer of other open spaces and private apartment gardens to management company;
- Controlled use of fertiliser, pesticide and herbicide by managing agencies;
- Noise and air quality monitoring to be carried out by Environmental Health Department in accordance with normal practice;

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- Public transport service performance level monitoring by Translink or service provider in accordance with service provision agreement;
- Offsite road improvements and Transport Plan recommendations and monitoring by DfI Roads; and
- Completion of archaeological reports, submission to HED by consultant archaeologist and agreement on completion

17.6 Construction Environmental Management Plan

The CEMP contains information and instructions for the developer, contractors, maintaining/adopting bodies and environmental regulators operating on the site during both construction and operational phases of the development; it combines best practice on construction and ecology to provide clear guidance. It is intended that the CEMP will form part of the tender package for all contracts let on the site; it can be updated to reflect changes in best practice, with additional details added throughout the lifespan of the development.

Introduction

Pragma Planning & Development Consultants Limited has prepared the CEMP to comply with the Pollution Prevention Guidelines (PPGs) issued jointly by SEPA, NIEA and the Environment Agency. The relevant guidance notes are appended.

The EIS Chapters and the related shadow Habitats Regulations Assessment have been taken into account.

The Landscape Management Plan, details measures of habitat creation and management; it has also been taken into account in the preparation of the CEMP and is appended.

Contractor Standard

Fraser Homes Limited is a house builder and not a civil engineering contractor. A suitably experienced civil engineering contractor will be needed to construct the link road and other infrastructure and change site levels to enable house building, however, as the development is currently at Outline Planning Permission stage, a contractor has not yet been appointed. Therefore it is recommended that compliance with this CEMP be the subject of a condition on the planning approval.

As the client for the main contractor and as builder constructing parts of the development Fraser Homes will comply with the guidance set out below. It is clear that other contractors will be appointed to construct other parts of the development and in that context the condition recommended above is further necessitated. It is noted that

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the guidance has been withdrawn pending replacement by the Northern Ireland government departments; however, until that takes place it is retained as best practice. Once the guidance is replaced the new guidance will supersede the list below.

These documents will also be made available to the contracting staff and copies kept onsite during the construction works: -

- Oil storage Regulations: PPG 2 and PPG 1 and Control of Pollution (Oil Storage) Regulations (Northern Ireland) 2010 - Guidance notes for the onsite use and storage of oil(s), including petrol at your site;
- Control of Pollution (Oil Storage) Regulations (Northern Ireland) 2010;
- Works and maintenance in or near water: PPG 5. These guidelines cover construction and maintenance works in, near or liable to affect surface waters and groundwater's. Surface waters include rivers, streams/burns, dry ditches, lochs, reservoirs, ponds, canals, estuaries and coastal waters;
- Working at Construction and Demolition Sites: PPG 6. These guidelines address site planning for a suite of pollution generating activities including impacts on water, drainage, air and noise which are relevant to the proposed development;
- Incident Response Planning: PPG 21. These guidelines set out best practise for producing an incident response plan to deal with an environmental incident at your site;
- Drums and intermediate bulk containers: PPG 26. Guidance note to aid in the storage and handling of drums and Intermediate Bulk Containers (IBCs) in the operation of a site;
- Engineering in the Water Environment Good Practice (SEPA) Temporary Construction Methods (2009)

The above guidance will be complied with throughout the construction period.

Phasing

Development of the land is proposed to be phased in four main phases. The phases are identified on Figure E. The Ards and Down Area Plan directs that development shall commence from the southern part of the NS19 zoning at Bowtown Road; however, the sewage infrastructure is required to be brought through the zoning from the north at Movilla Road. Accordingly, the phasing programme enables development to

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commence in the south and once commencement has taken place also start in the north.

Contractor's Compound and Site Roads

Prior to the commencement of any phase of the development, a contractor's compound will be erected on site before any other construction activity, other than the construction of the first phase silt curtain takes place.

The contractor's compound will be located away from adjoining housing and at least 25 metres from the buffer zone around any water course and will comprise a compound surrounded by security fencing and include site offices, equipment stores, welfare facilities, first aid and parts storage in temporary portacabin-type buildings, generator and fuel storage and a parking area. Topsoil will be removed from the compound area and the land levelled to form a suitably flat area which will be surfaced with stone to provide an adequate permeable vehicle load-bearing surface.

Trenches are to be dug around each temporary building and backfilled with clean stone; roof top drainage will be directed to the trenches. Trenches will be reinstated after the development is complete.

An area of the compound will be used for the storage of fuel and oils, and this will be contained by a bund capable of containing 110% of the contents of the storage vessels. The bund will be constructed out of site arising material and lined with an impermeable membrane in order to prevent any contamination of the surrounding soils, vegetation and water table. The bunded area is to be inspected on a daily basis for leaks and any uncontaminated water contained therein is to be drained off.

Refuelling is to take place in a bunded area; a spill kit is to be made available, drip trays are to be provided beneath pumps and similar equipment and are to be checked regularly with any accumulated oil removed for disposal. The bunded area is to be inspected on a daily basis for leaks and any uncontaminated water contained therein is to be drained off.

A temporary settlement pond will be constructed to accommodate drainage from temporary hard surfaces. Drainage will be routed to the temporary settlement pond via trenches lined with either geotextile or turf.

Site roads used for construction purposes are to be excavated to form a level surface with the spoil arising stored on site for later re-use and will be surfaced with stone to provide an adequate permeable vehicle load-bearing surface.

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Drainage from haul roads will be collected via cross road trenches and diverted to the temporary settlement pond constructed for that particular phase of development (see below) using trenches lined with geotextile or turf.

Silt Management Plan

Silt pollution during construction is a major cause of environmental incidents. It can damage and kill aquatic life by smothering and suffocating and can cause flooding by blocking watercourses. The prevention of water becoming contaminated in the first place reduces the risk of pollution and the overall cost of control measures. The best approach to avoiding silt pollution is to use methods of work that reduce or eliminate working in the watercourse and that do not contaminate surface water.

Prior to the commencement of work in any phase the Principal Contractor for that phase will prepare a Silt Management Plan in accordance with NIEA Pollution Prevention Guidelines. The Principal Contractor will apply for the appropriate drainage and discharge licences from NIEA for temporary discharges during construction in advance of starting work.

During the initial site preparation works prior to the start of construction, there will be a requirement for the implementation of temporary measures to ensure controlled management of run-off draining from the construction site. Run-off from the construction site will not be allowed to drain directly into any watercourse and will be filtered and attenuated using a variety of measures alone or in combination including:

- Sediment traps.
- Settlement ponds and temporary storage areas.
- Sediment barriers such as silt fences, straw bales and earth bunds (used and positioned in appropriate locations).

In addition to the above, mitigation measures relevant to controlling soil erosion and surface run-off, focusing on those areas where there will be excavations and storage of materials, will include the following:

- Scheduling construction activities to minimize the area and period of time that soil will be exposed, particularly during wet periods.
- Construction areas will be demarcated from the rest of the site so as to minimize the disturbance of land not required for development.
- Installation of cut-off drains around the working areas to intercept surface run-off and divert it around the working areas.

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- Minimizing the stockpiling of materials and locating stockpiles as far away as possible from watercourses.
- Implementation of site working practices to minimize the risk of concrete spillages.
- Movement of construction vehicles and plant will be strictly controlled to minimize soil compaction and erosion.

Water Course Protection

Buffer Zones

A minimum buffer of 10 metres from the centre of any watercourse within the site is to be maintained at all times during construction.

Prior to the commencement of any construction activities on any phase or sub-phase adjacent to or including a watercourse the buffer zone shall be marked out on site and fencing erected along its line, which will be maintained until the works in that particular phase/sub-phase are complete.

As provided below an impermeable membrane or silt curtain will be included as part of the fence design where required.

No construction works, storage of materials or deposition of waste will take place within the buffer zone. This is subject to exceptions in respect to culverting and introduction of attenuated storm water outfalls (see below). Planting works as required by detailed planning permissions will be undertaken using hand dig methods.

The buffer zones will be inspected daily and maintained throughout the construction phase.

On completion of construction works the fencing will be removed and the ground reinstated with native planting.

Impermeable Membrane

The purpose of the membrane is to prevent any sediment or silt associated with the works from entering the water course as surface water run-off, even allowing for the buffer zone. Impermeable membranes will be erected as part of the fencing protecting the buffer zones, prior to the commencement of any other works.

The impermeable membrane will consist of a geotextile or silt curtain and will be installed along down-gradient portions of the working area, as part of the fence on the edge of the buffer zone.

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The membrane and buffer zone fence will be inspected daily and maintained throughout the duration of the construction works.

Temporary Settlement Ponds

Temporary settlement ponds will be introduced as a complementary measure to ensure the isolation of the working area and to prevent silt and sediment build up from entering the water courses while attenuating surface water flows within the construction phase.

The settlement ponds will be constructed on the downstream side of the works and will have a volume sufficient to accommodate the area of the works and lined using either clay from the site or an impermeable geotextile membrane. Soil excavated will be stored on site and re-used in infilling the pond when it is no longer required.

Channels lined with turf or geotextile will be constructed to provide routes for surface water flows from the works, including from haul routes, site preparation and construction areas to connect to the temporary settlement pond.

Outfall from temporary settlement ponds will be restricted to attenuate flows to greenfield run off rates.

Temporary settlement ponds will be inspected daily and silt build up removed during periods of dry weather.

Culverting

New culverting works required as part of this development are confined to one location where access is required.

The culvert will be designed in accordance with the following standards: -

- Careful consideration of the location and alignment to minimise local bed and bank erosion or excessive sediment deposition at the structure;
- Design to be passible by fish species present or likely to be present;
- Maintain the natural watercourse bed level and slope, culvert inserted below the natural bed level;
- Maintain the natural channel width;
- Maintain adequate water depth; and
- Maintain water velocity

Construction works will be undertaken following identification of any protected species and at times when fish are not spawning or emerging.

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In any event the works area will be isolated and kept dry, the natural bed material isolated and stored separately from other retained material to keep it clean and after construction restored to the riverbed. Any affected banks are to be restored by re-establishing native vegetation.

Replacement culverting works are also required to upgrade approximately 500 metres of existing culvert at the Bowtown Stream and divert it around the link road and sewage infrastructure. The existing culvert is undersized and causes flooding at the site and upstream; consequently the replacement provides increased capacity. This upgrading has been modelled in the flood risk assessment in Appendix 11, which shows flooding relieved upstream without exacerbation downstream.

The culvert will be designed in accordance with the following standards: -

- To be constructed from the existing outfall at the Bowtown Road north;
- By-pass the existing chamber from upstream manholes and connect to the existing culvert downstream of the chamber;
- Upgrade the chamber and connect upgraded and existing culverts into it;
- Remove the bypasses and de-commission the redundant culvert

Piling Works

There are no piling works required as part of this development.

Dewatering / Abstraction from Watercourse

There will be no abstraction of water for construction purposes. Water required for construction activities will be from mains supplies or be brought to site in bowsers.

Where dewatering is required during the construction works a flume pipe is to be used unless following assessment by a civil engineer it is determined that another method such as a coffer dam can be used. All works are to be designed by a qualified engineer.

Storage and Use of Hydrocarbons

Refuelling will only take place in a designated site compound (outside buffer zone) and on concrete hard-standing, to prevent contamination into the underlying strata.

Compounds will be set up in a location on the up-gradient of the boundary of the site and will not be located on the down-gradient boundary of the site.

Fuel for plant will be stored in a bunded locked fuel bowser in the site compound and will be constructed in line with the recommendations provided in PPG 1, PPG 2 and the Control of Pollution (Oil Storage) Regulations (Northern Ireland) 2010.

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Plant will be tracked to the fuel bowser for re-fuelling, which will be located away from any surface water drainage. Drip trays or nappy sacks will be used during the refuelling process. Petrol will be stored in 5ltr plastic proprietary marked fuel containers and stored in locked steel containers within the site compound, funnels or re-fuelling hoses will be used for re-fuelling plant. A spill kit will be kept at the site compound within easy access to the fuel storage. Care to be taken during deliveries to ensure that no over filling occurs.

Operational Phase overlaps with Construction Works

The storm water system within the development as set out in Chapters 7 and 10 of this ER is to be an attenuated system with oversized storm sewer pipes feeding to the local watercourses via a number of hydrobrakes to attenuate the flow to the greenfield run off rate of 830 litres per second. Chapter 11 identifies 5 separate sub-areas of the site that contribute to the overall figure above. The specification of the hydrobrake will be that set out in Chapter 11 and Appendix 11.

Construction methodology for inserting operational phase drainage outfalls within buffer zones will be in accordance with the following guidelines: -

- Planning and site set-up to identify key protected species using the watercourse, timing for works, pollution sources and flood risks;
- Isolate the area of the works through secondary fencing and signage and divert water through a flume pipe to temporarily by-pass the working area. The flume pipe and associated works are to be appropriately designed by an appropriately qualified engineer;
- Site clearance of vegetation timed to avoid bird breeding season and other sensitive periods, vegetation to be composted either on site or provided to registered contractor;
- Stockpiling to take place outside the buffer zone in a dedicated area close to the works with appropriate measures to prevent silt runoff, from where the material can be replaced once the outfall has been completed;
- Concrete is not to be mixed within the buffer zone or working area, concrete will be mixed in the appropriate locations and transferred to the working area when needed; and
- Re-instatement of bed and banks following works using the excavated material and native planting.

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Noise and Air Quality Control Measures

Noise limits and construction work timings are set out in table 1 below.

Table 1: Threshold Values from BS5228+A1:2014

Assessment category and threshold value period	Threshold value, in decibels (dB) (LAeq,T)		
	Category A A)	Category B B)	Category C C)
Night-time (23.00-07.00)	45	50	55
Evenings and weekends D)	55	60	65
Daytime (07.00-19.00) and Saturdays (07.00- 13.00)	65	70	75
<i>NOTE 1 A potential significant effect is indicated if the LAeq,T noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.</i>			
<i>NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (I.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total LAeq,T noise level for the period increases by more than 3 dB due to site noise</i>			
<i>NOTE 3 Applied to residential receptors only</i>			
<i>A) Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.</i>			
<i>B) Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.</i>			
<i>C) Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.</i>			
<i>D) 19.00-23.00 weekdays, 13.00-23.00 Saturdays and 07.00-23.00 Sundays</i>			

Works on plots adjoining residential properties prior to the shell of the dwelling(s) being completed shall commence at 8.00 and cease at 18.00.

Specifications for the management and maintenance of plant and equipment are set out in the section below.

Site haul roads are to be swept for dust once a week and a mobile bowser used to keep surfaces damp during dry weather. Weekly site and area inspections will be conducted to monitor emissions.

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Wheel washing facilities are to be installed; these are to be securely constructed with no overflow and the effluent contained for proper treatment and disposal.

Plant and Equipment

All plant and equipment is to be maintained by the contractor according to the manufacturer's instructions. All plant and equipment is to be serviced regularly to ensure it is at optimum operating efficiency with respect to noise and air quality emissions.

Plant and equipment is to be inspected daily with records and certificates of inspections held on site.

Only emergency repair of plant and equipment is to take place on site, where it is possible this is to take place within the compound. All maintenance and servicing of plant and equipment is to take place off site at appropriate facilities.

A 'no idling' policy shall be adopted in relation to all plant and equipment. Plant and equipment located within the site compound shall be acoustically screened and where possible silenced.

Topsoil and Stockpiles

All material excavated is to be retained on site, where possible. An isolated hotspot of hydrocarbon contamination related to the agricultural use was identified at one of the groups of farm buildings, its treatment is specified in Chapter 7 as supervised excavation and removal of the contaminated soil and confirmation that retained soils are clean.

In the event that further contamination is identified all work in that area shall cease and appropriate professional advice sought, a remediation strategy shall be prepared and agreed with the appropriate authorities in the Council and DAERA and implemented on site prior to further work continuing in that area.

Topsoil and excavated materials stored on site are to be stockpiled to a height of not more than two metres and contained against wind-blow.

A mobile bowser shall be used to minimise dust arising during periods of dry weather.

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Dust Management

A detailed dust management plan will be developed in conjunction with the main contractor. The measures contained in the dust management plan will include: -

- Site Management:
 - Keep and compile records of all dust and air quality complaints, exceptional incidents and regular monitoring. The records to be made available to all relevant regulatory authorities;
 - Regular monitoring will take the form of twice weekly on-site and off-site inspection, to visually monitor dust;
 - Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site and fully enclose site or specific operations where there is a high potential for dust production;
 - Wet methods are to be used to suppress dust including on machinery and equipment and to keep site fencing, barriers and scaffolding clean. An adequate water supply for these purposes is to be retained on site and site runoff of water or mud is to be avoided;
 - Remove materials that have a potential to produce dust from site as soon as possible, unless being reused on site.
 - Use covered skips, enclosed chutes and conveyors and minimise drop heights from loading and handling equipment;
 - No bonfires or burning of waste materials on site;
 - Cutting, grinding or sawing equipment should only be used in conjunction with suitable dust suppression techniques such as water sprays or local extraction;
 - Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event.
- Demolition: -
 - Strip the interiors of buildings before demolition;
 - Ensure effective water suppression during demolition;
 - **ALL Asbestos Containing Materials (ACMs)** to be removed before demolition by a licensed asbestos removal contractor.

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- Construction: -
 - Avoid scabbling concrete surfaces if possible;
 - Store sand and other aggregates in bunded areas and keep damp;
 - Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery;
 - For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.
- Vehicle movement: -
 - Ensure vehicle engines do not idle;
 - Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
 - Use a mobile bowser for dust suppression and a water assisted dust sweeper on the access and local roads, to remove, as necessary, any material tracked out of the site.

Protection of Retained Habitats

Tree protection and habitat protection zones for each sub-phase will be delineated by the landscape architect. Fencing will be erected on the line of the protection zones with appropriate signage, to ensure they are observed.

Refuges will be delineated, in particular bat and badger foraging habitat.

No tree removal will take place during the bird breeding season; tree and building removal will only take place following a bat survey.

Areas fenced off and protected as refuges and buffer zones, will be out of bounds to construction personnel.

Contractors will be required to develop and register method statements when working in proximity to sensitive areas. Method statements are to be developed by an ecologist and agreed with the Council.

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Habitat Creation

To maximise ecological utility of areas of habitat creation, works will commence in accordance with the Mitigation Programme.

Details and specifications for the area of lowland meadow are to be in general conformity with the Landscape Management Plan.

Habitat creation actions, including phased introduction of new habitats are described in detail in the section titled 'Habitats' below.

Waste Disposal

Foul Sewage

Toilets are to be installed in the contractor's compound; no facilities are to be provided outside the compound.

Chemical toilets can be used but only where there is no connection to mains foul drainage available; the availability of mains foul sewage is to be checked in advance of setting up the compound.

If chemical toilets are being used they are to be emptied daily.

Construction Waste

The contractor is to adopt standard waste minimisation techniques and enter into an agreement with a waste disposal company to remove construction waste for recycling.

Skips are to be covered to prevent dust and litter being blown out and rainwater from accumulating inside; they should be inspected regularly. Skips are to be replaced when full.

Domestic Waste

Domestic waste, particularly that containing putrescent material, such as food, is to be kept separate from construction waste. The contractor is to arrange a suitable day for removal of domestic waste with either the local council or a registered waste handling company.

Special Waste

Any special waste is to be removed by a waste contractor registered with DfC. A written description of the waste is to be given to the waste contractor.

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Concrete, Cement and Grout

External concrete and cement mixing will take place on an impermeable designated area.

Surplus dry concrete, cement and grout should be used elsewhere on site if possible, or as inert rubble.

Equipment, such as chutes, portable mixers, barrows, pump lines, shovels, will be washed out in a designated area of hard standing drained to a sump; solids will be removed to the curing area (see below) and will be re-used on site. Any excess concrete, cement and grout will be removed from site by a registered waste carrier.

All cement bags will be sealed after use and stored in a waterproof storage container with excess removed from site by a registered waste carrier.

Concrete mixing and delivery lorries will be sent back to the batching plant for washout.

Excess concrete will be contained in a designated area to allow the concrete to cure without polluting the ground or watercourses prior to re-use as surplus dry concrete.

Responsible Person

The developer will appoint a person to oversee the management of the CEMP on site.

Habitat Management

Light, Noise and Dust

Areas of particular utility to foraging bats will not be lit using floodlighting or other artificial systems. All street lighting in the vicinity of suitable bat habitats will be provided with full vertical cut off devices.

Protected Species

- Badger

Badgers are protected under Article 10 and Schedules 5, 6 and 7 of the Wildlife (Northern Ireland) Order 1985. This makes it illegal to kill, injure or take a badger or damage, destroy or obstruct access to a sett.

Protection zones of 25 metres radius from the sett entrances will be established, fencing will be high visibility and temporary in nature with the purpose of keeping contractor

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operatives out of the zone while allowing the badgers free access. No vehicles, works, deposition or stockpiling of materials will be permitted within the protection zones.

Construction works in the vicinity of the protection zones will cease two hours before sunset. Open excavations will be covered to prevent accidental wildlife access or will permit a means of escape, pipes will be temporarily capped to prevent access.

Low level lighting schemes will be employed where required during the operational phase within protection zones, for example in the play areas.

- Bats

All native bat species are protected under Schedule 5, 6 and 7 of the Wildlife (Northern Ireland) 1985. This makes it illegal to kill injure or disturb a bat when roosting. It is also an offence to damage, destroy or obstruct access to any place that bats use for shelter or protection whether bats are present or not.

Light tolerant bat species may benefit from garden habitats associated with the development.

For light intolerant species, provision has been made to provide dark peripheral wildlife corridors and foraging areas. All bat species on site are likely to benefit from additional roost provision and an increase in the provision of species rich hedgerows and lowland meadow.

- Birds

Birds are protected by law in Northern Ireland under the Wildlife (Northern Ireland) 1985. This make is an offence to kill, injure or take any wild bird, take, damage or destroy the nest of any wild bird whilst in use or being built or take or destroy the egg of any wild bird.

Initial construction scheduling will protect all permanent and temporarily retained habitats, schedule works involving significant noise outside the bird breeding season and establish mitigation in year one to allow maximum development of ecological utility of created habitats.

Lighting

Change in land use will involve a significant increase in nocturnal ambient light levels and this has the potential to impact negatively on bat species on the site. Bat boxes, supplemented by integrated roosting space (bat roosts built into buildings) will be provided throughout the site to provide suitable roost sites across the development. Final roost locations will be determined on a species-specific

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basis by an ecological consultant engaged for the purpose, and bat boxes will be erected at varying heights and locations to benefit all species currently using the site.

Whilst the majority of bat boxes will be located in woodland areas or on woodland edges, some will be installed in association with buildings on site. The locations of these bat boxes will be decided upon when final lighting regimes on the site are known. Artificial lighting regimes have significant impact on bat ecology as all bat species are nocturnal, resting in dark conditions in the day and emerging at night to feed. Many species of bats are known to sample the light levels before emerging from their roost, only emerging for their night's hunting when the light intensity outside reaches a critical level after sunset.

Artificial lighting disrupts the normal 24-hour pattern of light and dark which is likely to affect the natural behaviour of bats. Accordingly, the final siting of bat boxes in the vicinity of buildings will be delayed until the light levels associated with these buildings can be measured/modelled.

To further minimise the impact of lighting on bats, low-pressure sodium lamps are proposed for street and floodlighting on site as studies have shown that lighting of this type minimises the likelihood of significantly disturbing local bat populations. Areas of the site of greatest utility to bats (woodland edges and wildlife corridors) will not be directly illuminated at night. Where possible, lights will be directed low with minimal light spillage (for example, limiting the height of lighting columns and/or fitting hoods that direct the light below the horizontal plane).

Some parts of the site will be kept dark, preferably at bat emergence (0-1 hour after sunset) and during peak bat activity periods (e.g. 1.5 hours after sunset and 1.5 hours before sunrise). Bat boxes will be inspected periodically as part of ongoing monitoring efforts and will be replaced when necessary. Boxes in use by roosting bats will be noted and roosts reported to the Northern Ireland Bat Group.

Monitoring

During the construction phase it is recommended that a responsible person be appointed to ensure the contractor complies with its proposals; monitoring of the main activities will be as follows: -

- Repetitive daily checks of: -
 - Bunded areas in the contractor's compound;
 - Wheel wash;
 - Chemical toilets;

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- Skip fill levels; and
- Protective fencing
- Repetitive weekly checks of: -
 - The watercourse for silt and debris build-up;
 - Dust levels on the site and in the surrounding area;
 - Noise levels
 - Stockpiles;
 - Plant and equipment; and
 - The mobile bowser

Specific monitoring activities are separate from the above and involve actions in both construction and operational phases, they will be carried out by an experienced practitioner; these involve: -

- Archaeological investigations and the topsoil strip for each phase will be monitored by a qualified archaeologist on site, on completion of each set of works a report detailing each find, together with laboratory analysis will be written up and submitted to HED;
- Public Transport take up and use will be monitored by Translink or the public transport provider; the requirement for this will be written into the agreement between the parties to provide the service. The provider will report to the developer and DfI Roads annually;
- Off-site road improvements are the responsibility of DfI Roads once works are complete; accordingly, DfI Roads will be responsible for monitoring their success; and
- Use and take-up rates of the office pods, will be monitored by the developer; additional floorspace will be obtained through application to the Council planning department.

During the operational phase, the environmental management actions will be monitored to ensure their effectiveness; the monitoring activities are: -

1. Botanical diversity once per annum;
2. Mammal monitoring will be carried out in May 2019 and again in May 2021;

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3. The retained ecologists will provide a report at the end of 2019 on baseline conditions; following the commencement of development further reports will be produced following all major monitoring actions

Transfer of the open space and ecologically sensitive areas to the residents' association involves transfer of responsibility for monitoring. Up to transfer monitoring will be the responsibility of the developer, post transfer it will be the responsibility of the adopting agency. The transfer documentation must fully describe the monitoring requirements.

Recommendations

As noted above a condition requiring compliance with the CEMP should be attached to any planning permission.

Additionally it is recommended that a further condition be applied requiring, prior to the commencement of development, the main contractor to update the CEMP and include further detail, in particular in relation to: -

1. Drawings detailing how the mitigation measures can be implemented during construction and operation;
2. Emergency pollution response plan; and
3. Construction Method Statement

As noted above it is recommended that a responsible person be appointed to oversee the implementation of the CEMP during the construction phase.

17.7 Monitoring

During the construction phase the CEMP recommends appointment of a responsible person to ensure the contractor complies with its proposals as set out in the previous section.

Transfer of the open space and ecologically sensitive areas to the residents' association involves transfer of responsibility for monitoring. Up to transfer monitoring will be the responsibility of the developer, post transfer it will be the responsibility of the adopting agency. The transfer documentation must fully describe the monitoring requirements.

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17.8 Implementation

It is proposed that implementation of the CEMP be secured through the application of conditions to a planning approval or, where conditions cannot be applied, through a Planning Agreement under Section 76 of the Planning Act (Northern Ireland) 2011. Separate agreements with undertakers may also be required to ensure the impacts of the development are suitably addressed.

It is envisioned that conditions will address the following aspects of the mitigation: -

- Implementation of works including link road, mains sewer, pumping station and culvert upgrading;
- Remediation of contaminated land hotspot and general approach to further contamination if identified;
- Retention of trees;
- Tree removal outside the bird breeding season and in accordance with bat requirements;
- Demolition in accordance with bat and other ecological requirements;
- Implementation of the Construction Environmental Management Plan;
- Archaeological investigations;
- Installation of the storm water drainage system;
- Noise nuisance control;
- Removal of topsoil and excavated material;
- Off site road improvements;
- Provision for public transport;
- Non-residential, commercial/community use; and
- Open space transfer arrangements.

17.9 Conclusions

The combination of conditions and agreements, together with precisely delineated monitoring arrangements ensures that the mitigation measures can be implemented fully, and residual impacts reduced to the levels described in the Assessment chapters.