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16. INTERACTION OF FOREGOING

16.1 Introduction

The preceding chapters 5 – 15 of this EIAR identify the potential significant environmental effects that may occur in terms of Population and Human Heath, Biodiversity, Land, Soils and Geology, Hydrology and Hydrogeology, Air Quality, Climate, Noise and Vibration, Landscape and Visual, Cultural Heritage, Material Assets (Roads and Traffic, and Built Services), and Major Accidents and Natural Disasters, as a result of the Proposed Development as described in Chapter 4 of this EIAR.

All of the potential significant effects of the Proposed Development and the measures proposed to mitigate these have been outlined in the preceding chapters of this EIAR. Mitigation measures and best practice measures for the construction, operation and decommissioning of the Proposed Development are detailed in the accompanying Construction and Environmental Management Plan (CEMP) (Appendix 4-1), and Chapter 17 Schedule of Mitigation and Monitoring Measures.

However, for any development with the potential for significant environmental effects there is also the potential for interaction between these potential significant effects. The result for interactive effects may exacerbate the magnitude of the effects or improve them or have a neutral effect.

The 'Proposed Development' considered for the purposes of this EIAR consists of a Large-Scale Residential Development (LRD) in Knocknacarra, Co. Galway.

Article 3 of EIA Directive 2011/92/EU as amended by Directive 2014/52/EU sites that the environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors: (a) population and human health; (b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC; (c) land, soil, water, air and climate; (d) material assets, cultural heritage and the landscape; (e) the interaction between the factors referred to in points (a) to (d). The assessment in this chapter assesses the interaction between the relevant assessments in this EIAR.

A matrix is presented as Table 16-1 below to identify the potential interaction of impacts between the various aspects of the environment assessed throughout this EIAR. The matrix highlights the potential for the occurrence of positive, neutral or negative effects during both the construction (C) and operational (O) phases. The matrix is symmetric, with each environmental component addressed in the chapters of this EIAR being placed on both axes of a matrix, and therefore each potential interaction is identified twice. In Section 16.2 below, the potential interactions between each environmental component have been discussed in order of the relevant chapters of the EIAR. Once a potential interaction between two environmental components has been discussed, i.e., Population & Human Health and Hydrology & Hydrogeology, the interaction will not be discussed again in the following relevant section, i.e., Hydrology & Hydrogeology and Population & Human Health in the Hydrology & Hydrogeology section.

Table 16-1 Interaction Matrix: Potential for Interacting Impacts

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	Phase	Population and Human Health	Biodiversity, Flora and Fauna	Land, Soils and Geology	Hydrology & Hydrogeology	Air and Climate	Noise and Vibration	Landscape and Visual	Cultural Heritage	Material Assets
Population and Human Health	C									
	O									
Biodiversity, Flora and Fauna	C									
	O									
Land, Soils and Geology	C									
	O									
Hydrology & Hydrogeology	C									
	O									
Air and Climate	C									
	O									
Noise and Vibration	C									
	O									
Landscape and Visual	C									
	O									
Cultural Heritage	C									
	O									
Material Assets	C									
	O									

Legend: No Interacting Effect: Positive Effect: Neutral Effect: Negative Effect:

The potential for interaction of impacts has been assessed, throughout this EIAR, as part of the Impact Assessment process. While the work on all parts of the EIAR was not carried out by MKO, the entire project and work of all sub-consultants was managed and coordinated by the company. This EIAR was edited and collated by MKO as an integrated report of findings from the impact assessment process, by all relevant experts, and impacts that potentially interact have been assessed in detail in the individual chapters of the EIAR above and summarised in Section 16.2 below.

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Where any potential negative impacts have been identified during the assessment process, these impacts have been avoided or reduced by design and the proposed mitigation measures, as presented throughout the EIAR and highlighted in Section 16.2 below.

16.1.1 Statement of Authority

This section of the EIAR has been prepared by Tom Madden and reviewed by Karen Mulryan, both of MKO. Tom is a Project Environmental Scientist and has over five years working in various Environmental Consultancies throughout Ireland. He holds a BSc (Hons) in Environmental Science from the University of Limerick. Karen is a Senior Environmental Scientist with MKO with over 10 years' experience in the consultancy sector. Karen holds a BA International in Archaeology from NUI Galway and a MSc in Archaeology from the University of Edinburgh. Karen's professional consultancy experience comprises project management, environmental impact assessment reporting and peer reviewing, site selection, feasibility assessment, client liaison and stakeholder engagement. Karen's project management and EIA coordination experience includes large scale renewable energy developments, specifically wind and solar, grid infrastructure, large scale flood relief schemes and residential developments. Karen holds memberships with the Chartered Institute for Archaeologists (ACIfA) and the Institute of Archaeologists of Ireland (IAI).

16.2 Impact Interactions

16.2.1 Population and Human Health

Population & Human Health and Hydrology & Hydrogeology

Any impacts associated with any development on water has the potential to impact on human health, in particular where water abstraction sources are present. Hydrocarbons will be used onsite during construction. All hydrocarbons will be handled and stored in accordance with best practice mitigation measures. With the implementation of these measures as detailed in Chapter 8 Hydrology and Hydrogeology and the CEMP (Appendix 4-1), the residual interacting effects associated with soil or ground contamination during the construction phase and subsequent health effects are short term, Negative Imperceptible and Not Significant. There is no potential for interacting effects between population and human health and hydrology and hydrogeology during the operation phase. Also, there are no water abstraction points in the vicinity of the site.

Population & Human Health and Air & Climate, Noise and Vibration

As identified in Chapter 4 of this EIAR, the construction phase has the potential to create a short-term, negative effect on human health due to the nuisance caused by construction plant and vehicle noise emissions, should the mitigation measures outlined in Chapter 9, 10 and 11, Air, Climate and Noise & Vibration not be implemented.

During the operational phase the Proposed Development has the potential to generate noise but as identified in Chapter 11 Noise & Vibration, the potential effects on population and human health are imperceptible.

Population & Human Health and Landscape and Visual

The construction of the Proposed Development will lead to the removal of areas of hedgerow and stone walls. The potential landscape and visual effects on the local population will result as the site changes from its existing state (greenfield and brownfield) to a construction site of considerable size. However, the Proposed Development includes a Green Corridor designed to provide ecological and recreational

connectivity to these parks in a future receiving environment. This will lead to an overall neutral effect on the local area.

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16.2.2 Biodiversity

Biodiversity, Flora & Fauna and Land, Soils & Geology

The disturbance of soils within the Proposed Development area will result in habitat loss and some disturbance of fauna in the areas surrounding the works area. Where possible, the excavated soil will be used for reinstatement and landscaping works around the site.

The interacting effects between the removal of habitats and the removal of soil due during the construction of the Proposed Development is Not Significant.

Biodiversity, Flora & Fauna and Hydrology & Hydrogeology

Site activities have the potential to give rise to some water pollution (although this is limited), and consequential impacts on flora and fauna that rely on or use that water within the same catchment. These potential effects have been assessed in Chapter 6 and Chapter 8 of this EIAR, and the relevant measures will be in place to avoid any water pollution and subsequent effect on flora and fauna.

Biodiversity and Air Quality

Site activity during the construction phase could give rise to dust that could be a nuisance to flora and fauna. The mitigation measures outlined in Chapter 9 of the EIAR will ensure that the potential for negative effects is reduced or eliminated. Provided that the mitigation measures are implemented, the negative effect will be not significant.

Biodiversity and Climate

The construction phase of the Proposed Development will lead to emissions from plant and machinery use and transport (i.e. exhaust emissions). Following implementation of the mitigation measures presented in Chapter 10, residual effects of greenhouse gas emissions arising from the construction phase of the Proposed Development will have a short-term imperceptible negative effect on climate. However, once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities will have a permanent imperceptible negative effect on climate. Climate change effects can lead to an increase in intense weather events, causing increased disturbance to biodiversity. The potential for interaction of biodiversity and climate effects is considered to be imperceptible due to the low quantity of greenhouse gases that will be emitted during construction of the Proposed Development.

Biodiversity, Flora & Fauna and Noise & Vibration

Site activity during the construction of the Proposed Development has the potential to give rise to noise and some vibration that could disturb fauna. This will occur only during the construction phases which will be short term. Mitigation measures have been provided in Chapter 11 and the CEMP.

The limited onsite noise activity generated by the Proposed Development during the operational phase will have a negative, imperceptible and permanent effect on biodiversity

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16.2.3 Land, Soils and Geology

Land, Soils & Geology and Hydrology & Hydrogeology

The movement and/or removal of soils, overburden, gravel and rock as part of the construction activities has the potential to have secondary impacts on water quality in the absence of mitigation. Mitigation measures are presented in Chapter 7 and Chapter 8.

The likelihood of negative impacts or interactions during the operational phase is much reduced as construction equipment, vehicles and fuels will be removed from site. Houses will be heated by air to heat pumps and thus there will be no requirement for significant volumes of fuels to be stored at the site during the operational phase. With the implementation of the prescribed mitigation measures the residual effect will be a negative, imperceptible, direct, short-term, unlikely effect during the operational phase.

Land, Soils and Geology and Air and Climate

The movement and/or removal of soils, overburden and rock as part of the construction activity has the potential to give rise to dust effects. Mitigation measures are presented in Chapter 9 to minimise the risk of any such issues. With the implementation of the mitigation measures, the Proposed Development is considered to have a short-term, slight, negative effect on air quality brought about by dust emissions generated during the construction activities, that is not significant

Interactive effects during the operational phase are deemed to be imperceptible and negative. These effects would be associated with the operation of vehicles of homeowners within the site. The houses will be heated by electric powered air to heat pumps and thus there will be no requirement for fossil fuels (kerosene) for heating purposes.

Land, Soils and Geology and Cultural Heritage

The movement and/or removal of soils and overburden as part of the construction activity has the potential to cause damage or disturbance to features of archaeological potential which were previously undiscovered. Preconstruction archaeological testing has been proposed which will be carried out by a suitably qualified archaeologist. If any features of archaeological potential are discovered during the course of the works, further archaeological mitigation may be required, such as preservation in-situ or by record. See Chapter 12 for further details of mitigation measures. Provided that the pre-commencement testing is carried out, the construction of the Proposed Development will not result in any direct, negative effects.

During the operational phase, there is no potential for impacts on cultural heritage from a land soils and geology perspective as there will be no groundworks excavations associated with this phase.

Land, Soils and Geology and Landscape and Visual

Earthworks such as cut and fill required to facilitate construction of the Proposed Development will have the greatest potential for direct landscape effects where the physical fabric of the landscape is materially altered. Where excavation is required, existing land cover, buildings and vegetation will be removed during the construction phase. The construction activities may potentially cause short term impacts on the landscape. It is considered that this is a 'Short-term', 'Negative', 'Imperceptible', effect in terms of landscape effects. On balance, these effects are not considered significant. The construction works will be 'Short-Term' in nature and completed as soon as practically possible.

During the operational phase, there is no potential for impacts on landscape from a land soils and geology perspective as there will be no groundworks excavations associated with this phase.

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16.2.4 Climate

Climate and Material Assets

The construction phase of the Proposed Development will see a slight increase in traffic volumes. This will lead to a slight increase in emissions from construction plant and machinery use and transport (i.e. exhaust emissions). These will be restricted to the duration of the construction phase, and as such will give rise to a short-term negative duration. This is assessed further in Chapter 10 of this EIAR, and mitigation measures are presented to minimise any potential effects.

During the construction phase of the Proposed Development there will be greenhouse gas emissions arising from production of construction materials (such as cement), and the operation of construction vehicles and plant. These will be restricted to the duration of the construction phase, and as such will give rise to emission over a short-term duration. However, once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities of material assets will have a permanent, imperceptible, negative effect on Climate, which is Not Significant.

During the operational phase, the Proposed Development will provide modern energy efficient homes at a time when demand for such developments is high. These homes will be heated with electric powered air to heat pumps which will remove the requirement for the burning of fossil fuels for heating homes.

Therefore, the Proposed Development will cause a permanent, imperceptible, neutral, effect on Climate.

16.2.5 Air Quality

Air Quality and Material Assets

The movement of construction vehicles both within and to and from the site has the potential to give rise to dust nuisance effects during the construction phase. This constitutes a short-term, slight, negative effect in terms of air quality, which is not significant. This is assessed further in Chapter 9 of this EIAR, and mitigation measures are presented to minimise any potential effects.

The operational phase of the Proposed Development will generate additional traffic to the area in the form of cars of homeowners. The addition of these vehicles to the area during the operational phase will give rise to a long-term, imperceptible, negative effect on air quality due to exhaust emissions.

16.2.6 Landscape and Visual

Landscape and Visual and Cultural Heritage

As described in Chapter 13 of this EIAR, no direct or indirect effects to the recorded cultural heritage resource as a result of the Proposed Development have been identified. However, pre-commencement archaeological testing has been proposed to be undertaken by a suitably qualified archaeologist prior to the start of construction works.

Operational effects are considered largely as a result of the proposed residential units.

Given the location and nature of the site, this effect is considered to be indirect, negative visual effect of the Proposed Development on sites and monuments range from imperceptible to not significant.

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16.2.7 Major Accidents and Natural Disasters

As described in Ch. 15 Major Accidents and Natural Disasters, major accidents or natural disasters are hazards which have the potential to affect the Proposed Development and lead to environmental effects both directly and indirectly. These include accidents during construction and operation of the Proposed Development caused by operational failure and/or natural hazards. The assessment of the potential for significant accidents or disasters is conducted in connection with the information that must be included in the EIAR. This includes aspects such as population and human health, biodiversity, land and soil, water, air quality, climate, cultural heritage, the landscape and material assets. The risk of a major accident and/or disaster during the construction of the Proposed Development is considered 'low' in accordance with the '*A Framework for Major Emergency Management – A Guide to Regional Risk Assessment'* (DoHLGH, 2024) Document.

The residual effect(s) associated with the construction and operation of the Proposed Development are Not Significant.

On this basis, the identified interaction during the construction and operation phase is Not Significant.

16.3 Mitigation and Residual Impacts

The Proposed Development will be constructed in accordance with the best practise measures and mitigation and monitoring as set out in the CEMP and as such, the residual effect(s) associated with the construction of the Proposed Development are Not Significant.

Where any potential interactive negative impacts have been identified in the above, a full suite of appropriate mitigation measures have been included in the relevant sections (Chapters 5-15) of the EIAR. The implementation of these mitigation measures will reduce or remove the potential for these effects. Information on potential residual impacts and the significance of effects, is also presented in each relevant chapter.