Appendix 8-1 Construction AADTs

Link No.	Road Name	Speed (Kph)	P1			P2 + P3			P4			P5		
			AADT Without CT	AADT With CT	% Impact	AADT Without CT	AADT With CT	% Impact	AADT Without CT	AADT With CT	% Impact	AADT Without CT	AADT With CT	% Impact
1	Golden Ball Access Road	50	135	135	0%	761	761	0%	766	766	0%	766	766	0%
2	R117 Enniskerry Road North	50	9472	9472	0%	7438	7438	0%	7545	7545	0%	7602	7602	0%
3	Between Glenamuck Road East	50	9089	9217	1%	7303	7303	0%	7393	7393	0%	7461	7461	0%
4	R117 Enniskerry Road South	50	2792	2920	5%	1438	1438	0%	1458	1458	0%	1469	1469	0%
5	Access Road Junction 2	30	0	0	0%	6	6	0%	6	6	0%	6	6	0%
6	Access Road Junction 1	30	0	128	0%	400	400	0%	400	400	0%	400	400	0%
7	R117 Enniskerry Road North	50	10808	10808	0%	5494	5494	0%	5528	5528	0%	5584	5584	0%
8	Access Road to Circle K	50	1155	1155	0%	1206	1206	0%	1228	1228	0%	1240	1240	0%
9	R117 Enniskerry Road South	50	9055	9055	0%	3144	3144	0%	3167	3167	0%	3189	3189	0%
10	R116 Ballybeatagh Road	50	2874	2874	0%	3488	3488	0%	3522	3522	0%	3556	3556	0%
11	R117 Enniskerry Road North	50	8982	8982	0%	3054	3054	0%	3105	3105	0%	3116	3116	0%
12	Ballycorus Road	50	3877	3877	0%	3054	3054	0%	3099	3099	0%	3116	3116	0%
13	R117 Enniskerry Road South	50	7258	7258	0%	0	0	0%	17	17	0%	0	0	0%
14	Access Road Junction 4	30	0	0	0%	0	0	0%	0	0	0%	0	112	0%
15	Proposed GLDR	N/A	4497	4497	0%	12459	12459	0%	12622	12622	0%	12797	12909	1%
16	Access Road Junction 3	30	0	0	0%	761	961	26%	761	865	14%	761	761	0%
17	Proposed GLDR	N/A	4497	4497	0%	12679	12879	2%	12842	12946	1%	13017	13129	1%

Appendix 8-2 Operational AADTs

Link No.	Road Name	Speed (Kph)	Base Year		Do Nothing (Redistributed Background Traffic)						Do Minimum (With Committed Development Traffic)						Do Something (With All Development Traffic)					
					Opening Year (2026)		Opening Year + 5 (2031)		Opening Year + 15 (2041)		Opening Year (2026)		Opening Year + 5 (2031)		Opening Year + 15 (2041)		Opening Year (2026)		Opening Year + 5 (2031)		Opening Year + 15 (2041)	
			AADT	%HGV	AADT	%HGV	AADT	%HGV	AADT	%HGV	AADT	%HGV	AADT	%HGV	AADT	%HGV	AADT	%HGV	AADT	%HGV	AADT	%HGV
1	Golden Ball Access Road	50	135	0%	124	0%	130	0%	130	0%	761	0%	766	0%	766	0%	761	0%	766	0%	766	0%
2	R117 Enniskerry Road North	50	9117	1%	5736	1%	6103	1%	6424	1%	7100	1%	7365	1%	7686	1%	7269	1%	7692	1%	7979	1%
3	Between Glenamuck Road East	50	8734	1%	5201	2%	5522	2%	5855	2%	7162	1%	7382	1%	7714	1%	7162	1%	7438	1%	7765	1%
4	R117 Enniskerry Road South	50	2682	1%	951	1%	1011	2%	1082	2%	1369	1%	1430	2%	1500	2%	1412	1%	1498	1%	1561	2%
5	Access Road Junction 2	30	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	6	0%	220	0%	197	0%
6	Access Road Junction 1	30	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	400	0%	1014	0%	919	0%
7	R117 Enniskerry Road North	50	10413	2%	3443	2%	3697	2%	3945	2%	5117	2%	5370	2%	5618	2%	5348	2%	6108	2%	6294	2%
8	Access Road to Circle K	50	1133	0%	1155	0%	1245	0%	1307	0%	1155	0%	1245	0%	1307	0%	1155	0%	1245	0%	1307	0%
9	R117 Enniskerry Road South	50	8723	2%	1691	2%	1820	2%	1944	2%	2930	2%	3060	2%	3184	2%	3065	2%	3477	2%	3573	2%
10	R116 Ballybeatagh Road	50	2778	5%	2874	5%	3054	5%	3240	4%	3308	4%	3488	4%	3674	4%	3404	4%	3809	4%	3961	4%
11	R117 Enniskerry Road North	50	8638	2%	1634	2%	1764	2%	1843	2%	2874	2%	3003	2%	3082	2%	3009	2%	3420	2%	3471	2%
12	Ballycorus Road	50	3725	1%	1634	1%	1747	2%	1831	2%	2874	1%	2987	2%	3071	2%	3009	1%	3404	2%	3460	2%
13	R117 Enniskerry Road South	50	6987	1%	0	0%	17	0%	23	0%	0	0%	17	0%	23	0%	0	0%	17	0%	23	0%
14	Access Road Junction 4	30	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1200	0%	1076	0%
15	Proposed GLDR	N/A	4328	N/A	11862	N/A	12589	N/A	13231	N/A	11862	N/A	12589	N/A	13231	N/A	11862	N/A	13361	N/A	13918	N/A

16	Access Road Junction 3	30	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	761	0%	1358	0%	1228	0%
17	Proposed GLDR	N/A	4328	N/A	11862	N/A	12589	N/A	13231	N/A	11862	N/A	12589	N/A	13231	N/A	12352	N/A	13518	N/A	14071	N/A

Appendix 8-3

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Climate Change Impact Assessment Report

PRESENTED TO

Liscove Limited

Proposed Large-Scale Residential Development at Wayside, Enniskerry Road and Glenamuck Road, Kilternan, Dublin 18

July 2024

Environmental Consultancy Services

DOCUMENT CONTROL SHEET

Client	Liscove Limited
Project Title	Proposed Large-Scale Residential Development at Wayside, Enniskerry Road and Glenamuck Road, Kilternan, Dublin 18
Document Title	Climate Change Impact Assessment Report

Rev.	Status	Author(s)	Reviewed by	Approved by	Issue Date
01	Draft for Client Review	Aoife Grogan *Senior Environmental Consultant*	Aoife Gillen *Principal Environmental Consultant*	Aoife Gillen *Principal Environmental Consultant*	28/06/2024
02	Final for Client Issue	Aoife Grogan *Senior Environmental Consultant*	Aoife Gillen *Principal Environmental Consultant*	Aoife Gillen *Principal Environmental Consultant*	04/07/2024
03	Final for Client Issue	Aoife Grogan *Senior Environmental Consultant*	Aoife Gillen *Principal Environmental Consultant*	Aoife Gillen *Principal Environmental Consultant*	22/07/2024

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The methodology adopted and the sources of information used by Enviroguide in providing its services are outlined in this Report.

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Unless otherwise stated in this Report, the assessments made assume that the site and facilities will continue to be used for their current or stated proposed purpose without significant changes.

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If the scope of work includes subsurface investigation such as boreholes, trial pits and laboratory testing of samples collected from the subsurface or other areas of the site, and environmental or engineering interpretation of such information, attention is drawn to the fact that special risks occur whenever engineering, environmental and related disciplines are applied to identify subsurface conditions. Even a comprehensive sampling and testing programme implemented in accordance with best practice and a professional standard of care may fail to detect certain conditions. Laboratory testing results are not independently verified by Enviroguide and have been assumed to be accurate. The environmental, ecological, geological, geotechnical, geochemical and hydrogeological conditions that Enviroguide interprets to exist between sampling points may differ from those that actually exist. Passage of time, natural occurrences and activities on and/or near the site may substantially alter encountered conditions.

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1 INTRODUCTION AND METHODOLOGY

Enviroguide Consulting has been commissioned to produce a Climate Change Impact Assessment Report (CCIA) on behalf of Liscove Limited for a Proposed Large-Scale Residential Development on 2 No. sites measuring 14.2 hectares at Wayside, Enniskerry Road and Glenamuck Road, Kilternan, Dublin 18 (hereafter referred to as the Proposed Development). A full project description is in included in Section 1.1 of this report.

The contents of this Report provide duty to the requirements of Dún Laoghaire-Rathdown County Council (DLRCC) for a Climate Change Impact Assessment as set out in Development Management Thresholds Information Document. It has been undertaken in accordance with 'Technical Annex B: Climate Change Risk Assessment' of the 'Local Authorities Climate Action Planning Guidelines' and provides a qualitative CCRA. A qualitative CCRA supports the identification and prioritisation of potential future climate risks for more detailed analysis and provides a broad understanding of where adaptation actions could be required.

This report can be utilised by the organisation to prepare for meeting EU sustainability reporting requirements under the Corporate Sustainability Reporting Directive (CSRD) and proposed Corporate Sustainability Due Diligence Directive (CSDD). Specifically, Standard ESRS E1-Climate change within the CSRD and environmental due diligence within the incoming CSDDD. Companies that fall under the scope of the Corporate Sustainability Reporting Directive (CSRD) also have to report in their annual reports to what extent their activities are covered by the EU Taxonomy (Taxonomy-eligibility) and comply with the criteria set in the Taxonomy delegated acts (Taxonomy-alignment).

Additionally, this Report provides information to support the relevant public body in carrying out its functions in a manner consistent with national climate plans and strategies and furthering the achievement of the national climate objective as set out under Section 15 of the Climate Action and Low Carbon Development Act 2015, as amended in 2021. Under the Act each local authority is required to prepare a local authority climate action plan for its administrative area. The plans are consistent with the most recent climate action plan and national adaptation framework. The plans are to address, and integrate, mitigation of greenhouse gases, climate change adaptation and strengthened alignment with national climate policy, delivering effective local climate action. The current CCIA report should be reviewed alongside the relevant and current Local Authority Climate Action plan to ensure alignment with relevant objectives and targets.

In accordance with DLRCC planning requirements, the Report will assess the impact of climate change on the Proposed Development and ensure that the policies and objectives produced and implemented by the local authority in relation to climate change and climate change protection measures, particularly in relation to drainage design, as set out within the Dún Laoghaire Rathdown County Development Plan 2022-2028 (DLR CDP), have been incorporated into the Proposed Development design. The relevant policy objectives of the DLR CDP have also been carefully considered in the context of associated UN Sustainable Development Goals (SDGs), and their incorporation into the Proposed Development design.

The physical climate risks which may affect the performance of the Proposed Development during its expected lifetime have been identified through a climate risk screening. Climate projections across the existing range of future scenarios have been examined, along with the Proposed

Development location, to gain an understanding of the future risks that climate change may have on the Proposed Development. The vulnerability of the Proposed Development to these risks has been subsequently assessed taking account of relevant adaptation and mitigation measures which have been incorporated into the Development design.

Furthermore, the policies and objectives produced and implemented by DLRCC in relation to climate change and climate change protection measures have been considered in conjunction with the Proposed Development design.

1.1 Project Description

Liscove Limited intend to apply for permission for a Large-Scale Residential Development on 2 No. sites, measuring c. 14.2 Ha., which will be separated by the future Glenamuck Distributer Link Road (GLDR). The western site principally comprises lands at Wayside, Enniskerry Road and Glenamuck Road, Kilternan, Dublin 18, which include a derelict dwelling known as 'Rockville' and associated derelict outbuildings, Enniskerry Road, Kilternan, Dublin 18, D18 Y199 and the former Kilternan Country Market, Enniskerry Road, Kilternan, Dublin 18, D18 PK09. The western site is generally bounded by the Glenamuck Road to the north; the Sancta Maria property to the north, west and south; a recently constructed residential development named "Rockville" to the north-east; the Enniskerry Road to the south-west; dwellings to the south; and the future GLDR to the east. The eastern site is generally bound by dwellings to the south; the future GLDR to the west; and greenfield land to the north and east.

Road works are proposed to facilitate access to the development from the Enniskerry Road; to the approved Part 8 Enniskerry Road/Glenamuck Road Junction Upgrade Scheme on Glenamuck Road (DLRCC Part 8 Ref. PC/IC/01/17); and to the approved Glenamuck District Roads Scheme (GDRS) (ABP Ref. HA06D.303945) on the Glenamuck Link Distributor Road (GLDR). Drainage and potable water infrastructure is proposed to connect to services on the Glenamuck Road, Enniskerry Road and the GLDR.

The Glenamuck Road access point will include works, inclusive of any necessary tie-ins, to the footpath and cycle track to create a side road access junction incorporating the provision of an uncontrolled pedestrian crossing across the side road junction on a raised table and the changing of the cycle track to a cycle lane at road level as the cycle facility passes the side road junction. Surface water and foul drainage infrastructure is proposed to connect into the drainage infrastructure to be constructed as part of the Part 8 scheme. Potable water is to be provided from the existing piped infrastructure adjacent to the site along Glenamuck Road. Surface water and foul drainage infrastructure connections for the 'former Country Market' area (north-west of the site) are proposed to connect into the drainage infrastructure at the Enniskerry Road/Glenamuck Road junction.

The GLDR 'western' access point will include works, inclusive of any necessary tie-ins, to the footpath and cycle track to create a side road access junction incorporating the provision of short section of shared path and an uncontrolled shared pedestrian and cyclist crossing across the side road junction on a raised table. The works will also include the provision of a toucan crossing, inclusive of the necessary traffic signal equipment, immediately south of the access point to facilitate pedestrian and cyclist movement across the mainline road. All works at this GLDR access point will include the provision of the necessary tactile paving layouts. Surface

water, foul drainage and potable water infrastructure connections are proposed into the drainage infrastructure to be constructed as part of the GDRS scheme.

The GLDR 'eastern' access point will include works, inclusive of any necessary tie-ins, to the footpath and cycle track to create a side road access junction incorporating the provision of short section of shared path and an uncontrolled shared pedestrian and cyclist crossing across the side road junction on a raised table. Potable water, surface water and foul drainage infrastructure connections for the eastern site are proposed into the drainage infrastructure to be constructed as part of the GLDR.

On Enniskerry Road, works are proposed to facilitate 3 No. new accesses for the development along with modifications to Enniskerry Road. The 3 No. side road priority access junctions incorporate the provision of an uncontrolled pedestrian crossing across the side road junction on raised tables. The modifications to Enniskerry Road fronting the development (c. 340 metres) includes the narrowing of the carriageway down to 6.5 metres (i.e. a 3.25 metres running lane in each direction) from the front of the kerb on the western side of Enniskerry Road. The remaining former carriageway, which varies in width of c. 2 metres, will be reallocated for other road users and will include the introduction of a widened pedestrian footpath and landscaped buffer on the eastern side of the road adjoining the proposed development. On Enniskerry Road at the interface of the proposed Dingle Way and Enniskerry Road, aligning with the proposed location of the community centre facilities and existing Our Lady of Wayside Church, works include the continuation of the Dingle Way surface materials across Enniskerry Road to create a raised table to connect these community facilities. The above works are inclusive of all necessary tie-in works such as new kerbs along the eastern side of Enniskerry Road, drainage details, road marking, signage and public lighting. Additionally, the development includes the removal of the existing stone wall and the construction of a new stone wall set back to facilitate the upgrade and realignment of the Enniskerry Road. Potable water is to be provided from the existing piped infrastructure along the Enniskerry Road.

At the 'Rockville access point', works are proposed to provide a multi-modal access, including a vehicular connection between the proposed development and the Rockville development (permitted under DLR Reg. Ref. D18A/0566). The new access will require the removal of the existing as-built hammerhead turning area at Rockville to create this new connection. The residual hammerhead area will be landscaped to tie into the adjoining landscape strategy. The above works are inclusive of all necessary tie-in works such as new kerbs, drainage details, road marking, signage, and public lighting.

Surface water and foul drainage infrastructure is proposed to connect into and through the existing/permitted Rockville developments (DLR Reg. Refs. D17A/0793, D18A/0566, D20A/0015 and D23A/0580).

The development will principally consist of: the demolition of c. 740 sq m of existing structures on site comprising a derelict dwelling known as 'Rockville' and associated derelict outbuildings (c. 573 sq m) and the former Kilternan Country Market (wooden structure) (c. 167 sq m); and the provision of a mixed-use development principally consisting of 487 No. residential units (196 No. houses, 201 No. duplex units and 90 No. apartments) and a Neighbourhood Centre. The western site will comprise 362 No. residential units and the Neighbourhood Centre, which

will provide an anchor retail store (c. 1,310 sq m), retail/commercial (c. 3,284 sq m), a restaurant (c. 182 sq m), a creche (c. 691 sq m), café (c. 326 sq m), and a community facility (c. 332 sq m), and the eastern site will comprise 125 No. residential units. The 487 No. residential units will consist of 53 No. 1 bedroom units (35 No. apartments and 18 No. duplexes), 150 No. 2 bedroom units (38 No. houses, 16 No. apartments and 96 No. duplexes), 236 No. 3 bedroom units (110 No. houses, 39 No. apartments and 87 No. duplexes) and 48 No. 4 bedroom units (48 No. houses). The proposed development will range in height from 2 No. to 4 No. storeys (including podium/undercroft level in Apartment Blocks 1, 2 and 3 and Duplex Block T and U on the eastern site).

The development also provides: a pedestrian/cycle route through the Dingle Way from Enniskerry Road to the future Glenamuck Link Distributor Road; 854 No. car parking spaces (125 No. in the undercroft of Apartment Blocks 1, 2 and 3 and Duplex Blocks T and U and 729 No. at surface level) including 28 No. mobility impaired spaces, 87 No. electric vehicle spaces, 2 No. car share spaces, and 4 No. drop-off spaces/loading bays; motorcycle parking; bicycle parking; bin storage; provision of new telecommunications infrastructure at roof level of the Neighbourhood Centre including shrouds, antennas and microwave link dishes (18 No. antennas, all enclosed in 9 No. shrouds and 6 No. transmission dishes, together with all associated equipment); private balconies, terraces and gardens; hard and soft landscaping; sedum roofs; solar panels; boundary treatments; lighting; substations; plant; and all other associated site works above and below ground. The proposed development has a gross floor area of c. 60,504 sq m above ground, in addition to an undercroft/basement (c. 4,485 sq m) containing car parking, bike storage, bin storage and plant under Apartment Blocks 1, 2 and 3 and Duplex Blocks T and U on the eastern site.

1.2 Legislative and Strategic Context

1.2.1 The EU Taxonomy Framework

Regulation (EU) 2020/852 of the European Parliament and of the Council (the 'Taxonomy Regulation') establishes the criteria for determining whether an economic activity qualifies as environmentally sustainable for the purposes of establishing the degree to which an investment is environmentally sustainable. Commission Delegated Regulation (EU) 2021/2139[1] (the 'Supplementing Regulation') establishes the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives.

The technical screening criteria as outlined within the Supplementing Regulation have been adopted for the purpose of this assessment.

The Supplementing Regulation establishes the technical screening criteria specific to certain economic activities. The Proposed Development, located at Wayside, Enniskerry Road, Kilternan, Dublin 18 consists of the construction of a Large-Scale Residential Development. Therefore, in accordance with Annex II, Section 7.1, of the Supplementing Regulation, the relevant technical screening criteria for the Proposed Development are set out under the "Construction of new buildings".

Annex II Section 7.1 of the Supplementing Regulation sets out the relevant technical screening criteria for the project to make a *'Substantial Contribution to Climate Change Adaptation'*. These technical screening criteria have been adopted in the current assessment to conduct a climate risk and vulnerability assessment and determine the adaptive capacity of the Proposed Development. [2]

Table 1-1 overleaf details the criteria for *"Substantial Contribution to Climate Change Adaptation"* and the associated sections of this Report in which these criteria have been addressed.

[1] Commission Delegated Regulation (EU) of 4.6.2021 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives.

[2] These criteria have been adopted for assessment purposes only and do not suggest that the Proposed Development qualifies as an 'environmentally sustainable' economic activity under the Taxonomy Regulation.

Table 1-1: Substantial Contribution to Climate Change Adaptation Screening Criteria

Substantial Contribution to Climate Change Adaptation Screening Criteria[3]	Relevant Section of this Report
The economic activity has implemented physical and non-physical solutions ('**adaptation solutions**') that substantially reduce the most important physical climate risks that are material to that activity.	See Section 4 of this report for Climate Risk and Vulnerability Assessment.
The physical climate risks that are material to the activity have been identified from those listed in Appendix A to this Annex by performing a robust **climate risk and vulnerability assessment** with the following steps: a) screening of the activity to identify which physical climate risks from the list in Appendix A to this Annex may affect the performance of the economic activity during its expected lifetime; b) where the activity is assessed to be at risk from one or more of the physical climate risks listed in Appendix A to this Annex, a climate risk and vulnerability assessment to assess the materiality of the physical climate risks on the economic activity; c) an assessment of adaptation solutions that can reduce the identified physical climate risk. The climate risk and vulnerability assessment is proportionate to the scale of the activity and its expected lifespan, such that: a) for activities with an expected lifespan of less than 10 years, the assessment is performed, at least by using climate projections at the smallest appropriate scale; b) for all other activities, the assessment is performed using the highest available resolution, state-of-the-art climate projections across the existing range of future scenarios consistent with the expected lifetime of the activity, including, at least, 10 to 30 year climate projections scenarios for major investments.	See Section 2 of this report for Climate Change Projections. See Section 3 of this Report for Climate Risk Screening. See Section 4 of this report for Climate Risk and Vulnerability Assessment.
The **climate projections** and assessment of impacts are based on best practice and available guidance and take into account the state-of-the-art science for vulnerability and risk analysis and related methodologies in line with the most recent Intergovernmental Panel on Climate Change (IPCC) reports, scientific peer-reviewed publications and open source or paying models.	See Section 2 of this report for Climate Change Projections.

[3] as set out in Annex II, Section 7.1 of the Supplementing Regulation.

Substantial Contribution to Climate Change Adaptation Screening Criteria[3]	Relevant Section of this Report
The **adaptation solutions** implemented: a) do not adversely affect the adaptation efforts or the level of resilience to physical climate risks of other people, of nature, of cultural heritage, of assets and of other economic activities; b) favour nature-based solutions or rely on blue or green infrastructure to the extent possible; c) are consistent with local, sectoral, regional or national adaptation plans and strategies; d) are monitored and measured against pre-defined indicators and remedial action is considered where those indicators are not met; e) where the solution implemented is physical and consists in an activity for which technical screening criteria have been specified in this Annex, the solution complies with the do no significant harm technical screening criteria for that activity.	See Section 4 of this report for Climate Risk and Vulnerability Assessment. See Section 5 of this report for Dún Laoghaire-Rathdown County Development Plan 2022-2028: Relevant Policies and Objectives This report **does not** demonstrate compliance with the relevant criteria for Do No Significant Harm as they relate to the remaining five environmental objectives; therefore, does not demonstrate full compliance with the Taxonomy Regulation.

1.2.2 IPCC Sixth Assessment Reports (AR6)

The Intergovernmental Panel on Climate Change (IPCC) was set up in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) to assess the science related to climate change so that government organisations at all levels would have a scientific basis from which to make decisions regarding climate change. The IPCC assessments of scientific research relating to climate change is written and reviewed by leading scientists worldwide, and then reviewed by experts in their field to ensure the reports reflect the full range of views in the scientific community. The IPCC reports undergo multiple rounds of drafting and review to ensure they are comprehensive and objective and produced in an open and transparent way.

The role of the Intergovernmental Panel on Climate Change (IPCC) is to critically assess the scientific, technical and socio-economic information relevant to understanding the physical science and impacts of human-induced climate change and natural variations, including the risks, opportunities and options for adaptation and mitigation.

The most up to date IPCC report is the Sixth Assessment Report (AR6)[4], which comprises of three Working Groups and a Synthesis Report, three Special Reports, and a refinement to its latest Methodology Report; these are as follows:

- **Working Group I (WGI)** contribution to the Sixth Assessment Report, *Climate Change 2021*: *The Physical Science Basis* was released on 9 August 2021.
- **The Working Group II** contribution, *Climate Change 2022: Impacts, Adaptation and Vulnerability* was released on 28 February 2022.
- **The Working Group III** contribution, C*limate Change 2022: Mitigation of Climate Change* was released on 4 April 2022.
- Special Report 1: *Global Warming of 1.5 ºC* (SR15, October 2018)
- Special Report 2: *Climate Change and Land* (SRCCL, August 2019)
- Special Report 3: *Ocean and Cryosphere in a Changing Climate* (SROCC, September 2019)
- The **AR6 Synthesis Report** integrates the three Working Group reports as well as the findings from the three cross-Working Group Special Reports prepared during this assessment cycle – this report is currently in review and will be finalised in late 2022 or early 2023.

AR6 has adopted a unified framework of climate risk, supported by an increased focus in WGI on low-likelihood, high impact outcomes. Systematic risk framing is intended to aid the formulation of effective responses to the challenges posed by current and future climatic changes and to better inform risk assessment and decision-making. AR6 also makes use of the 'storylines' approach, which contributes to building a robust and comprehensive picture of climate information, allows for a more flexible consideration and communication of risk, and can explicitly address low-likelihood, high-impact outcomes.

[4] Intergovernmental Panel on Climate Change (2022) Sixth Assessment Report (AR6).

The climatic impact-driver (CID) framework adopted in Chapter 12 of IPCC AR6 WGI allows for assessment of changing climate conditions that are relevant for regional impacts and for risk assessment.

1.2.3 Dún Laoghaire-Rathdown County Council Planning Requirements

The Development Management Thresholds Information Document prepared by Dún Laoghaire Rathdown County Council (DLRCC) acts as a guideline to assist applicants in relation to the documents they may be required to submit as part of their planning application. By assessing the 'Key Thresholds' table and the main Thresholds List, applicants will be informed as to what they may be required to submit as part of their planning application. In relation to the assessment of climate change, the following threshold applies to the Proposed Development:

Table 1-2: Extract from "Key Thresholds Table" contained within the DLRCC Development Management Thresholds Information Document

Policy/Heading	Submit	Threshold	Commentary
New Developments – Environmental Impacts	Climate Change Impact Assessment	50 residential units or more' and 'all other developments measuring 1,000 sq.m GFA and above	An assessment of the impacts of climate change on the development and provisions for these impacts in particular relating to drainage design.

The Proposed Development has met the threshold as specified within Table 1-2 above, therefore an associated Climate Change Impact Assessment (CCIA) is required. The Climate Change Impact Assessment (CCIA) Report will assess the impact of climate change on the Proposed Development and ensure that the policies and objectives produced and implemented by the local authority in relation to climate change and climate change protection measures, particularly in relation to drainage design, as set out within the Dún Laoghaire Rathdown County Development Plan 2022-2028 (DLR CDP), have been incorporated into the Proposed Development design.

1.2.3.1 Dún Laoghaire-Rathdown County Council Climate Change Action Plan 2024-2029

In February 2024, DLRCC adopted the Dún Laoghaire Rathdown Climate Action Plan 2024-2029 (DLR CAP). The Action Plan is the climate adaptation and mitigation strategy for the County, and sets out to achieve, by no later than the end of 2050, the transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral County. Aligned to the Government's National Climate Objective (as set out in the national Climate Action Plan 2024), the new Plan outlines mitigation and adaptation climate action measures across the following six thematic areas:

- Energy & Buildings;
- Transport;
- Flood Resilience;
- Nature Based Solutions;
- Circular Economy & Resource Management; and

- Community Engagement.

The actions in these themes collectively address the four targets of this plan:

1. 50% improvement in DLRCC's energy efficiency by 2030
2. 51% reduction in DLRCC's greenhouse gas emissions by 2030
3. To make Dublin a climate resilient region, by reducing the impacts of future climate change-related events; and
4. To actively engage and inform our communities on climate action.

The Plan sets out how DLRCC will be responsible for enhancing climate resilience, increasing energy efficiency and reducing greenhouse gas emissions across its own assets, services and infrastructure to which it is fully accountable for.

In the development of the CAP, DLRCC has reviewed the risks posed by climate change for the County and the implications of these risks for the delivery of services by DLRCC. This has been achieved through a Climate Change Risk Assessment (CCRA) which identifies the likelihood of future climate hazards and their potential impacts. The CCRA has been undertaken, in accordance with 'Technical Annex B: Climate Change Risk Assessment' of the 'Local Authorities Climate Action Planning Guidelines'.

A qualitative CCRA supports the identification and prioritisation of potential future climate risks for more detailed analysis and provides a broad understanding of where adaptation actions could be required. The approach comprises of two phases, where both current and future risks and impacts are assessed.

The risk screening methodology and findings employed within the DLR CAP has been considered in Section 3 of this report.

1.2.3.2 Dún Laoghaire Rathdown County Development Plan (CDP) 2022-2028

The new DLR CDP sets out the policy objectives and the overall strategy for the proper planning and sustainable development of the County over the plan period from 2022 to 2028.

The Climate Action chapter of the plan (Chapter 3) sets out detailed policy objectives in relation to climate action and the role of planning in climate change mitigation, climate change adaptation, and the transition towards a more climate resilient County. The Chapter addresses four key issues, namely:

- Energy Efficiency in Buildings;
- Renewable Energy;
- Decarbonising Motorised Transport;
- Urban Greening.

These issues have been identified as being of particular significance in helping to achieve sustainable planning outcomes which will ultimately help to deliver a low carbon and a climate resilient County. Planning already plays a role in each of the key areas identified in the DLR CCAP. Having regard to the headings set out in the DLR CCAP (Figure 1-1), the Development Plan contains a range of policy objectives which aim to mitigate and adapt to climate change.

The creation of a climate resilient County is an overarching strategic outcome of the DLR CDP, and as such, the theme permeates the entire plan with a selection of policy objectives in multiple Chapters all contributing to aid in the transition of the County to a climate resilient low

carbon society[5]. Relevant policy objectives and their incorporation into the Proposed Development design have been considered in Section 5 of this report.

1.2.3.3 Climate Action and Low Carbon Development Act

The Climate Action and Low Carbon Development Act 2015 (the principal act) set national climate policy on a statutory footing for the first time in Ireland, with the target of pursuing the transition to a low-carbon, climate-resilient, and environmentally sustainable economy by 2050. The principal act was subsequently amended by the Climate Action and Low Carbon Development (Amendment) Act 2021 (the '2021 Act') which sets Ireland on a legally binding path to net-Zero emissions no later than 2050, and to a 51% reduction in emissions by the end of this decade.

The 2021 Act provides a legally binding framework with clear targets and commitments set in law, and ensures the necessary structures and processes are embedded on a statutory basis to ensure Ireland achieves its national, EU and international climate goals and obligations in the near and long term.

The 2021 Act also introduces a requirement for each local authority to prepare a Climate Action Plan, which will include both mitigation and adaptation measures and be updated every five years. Local authority Development Plans will also align with their Climate Action Plan.

Furthermore, Public Bodies are obliged to perform their functions in a manner which is consistent with national climate plans and strategies and furthering the achievement of the national climate objective; this is set out under Section 15 of the Climate Action and Low Carbon Development Act 2015, as amended in 2021:

"Duties of certain bodies

15. *(1) A relevant body shall, in so far as practicable, perform its functions in a manner consistent with—*

(a) the most recent approved climate action plan,

(b) the most recent approved national long term climate action strategy,

(c) the most recent approved national adaptation framework and approved sectoral adaptation plans,

(d) the furtherance of the national climate objective, and

(e) the objective of mitigating greenhouse gas emissions and adapting to the effects of climate change in the State."

This Report has been prepared in accordance with the DLR Climate Action Plan 2024-2029 (and associated climate adaptation and mitigation strategy) and the policy objectives of the DLR Development Plan 2022-2028 relating to climate action and environmental infrastructure

[5] Dún Laoghaire-Rathdown County Development Plan 2022-2028.

and flood risk. These documents have been developed on foot of national climate action strategies, plans, and objectives and provide a regional approach to climate action, which is the overarching recommendation of national strategies and plans. Therefore, this Report provides information to support the relevant public body in carrying out its functions under Section 15 of the Climate Action and Low Carbon Development Act 2015, as amended in 2021.

1.2.3.4 National Adaptation Framework (NAF)

Ireland's first statutory National Adaptation Framework (NAF) was published on 19 January 2018 and was developed under the Climate Action and Low Carbon Development Act 2015. The NAF sets out the national strategy to reduce the vulnerability of the country to the negative effects of climate change and to avail of positive impacts.

The NAF builds on the work already carried out under the National Climate Change Adaptation Framework (NCCAF, 2012). The NAF outlines a whole of government and society approach to climate adaptation in Ireland. It also aims to improve the enabling environment for adaptation through ongoing engagement with civil society, the private sector, and the research community.

Under the NAF, several government departments are required to prepare sectoral adaptation plans in relation to the priority areas that they are responsible for, which is to be reviewed once every five years. Local authorities are required to prepare local adaptation strategies. The NAF also aims to ensure ongoing engagement with civil society, the private sector, and the research community.

1.2.4 Sustainable Development Goals

The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity by 2030. The 17 SDGs are integrated—that is, they recognise that action in one area will affect outcomes in others, and that development must balance social, economic, and environmental sustainability. The creativity, knowhow, technology and financial resources from all of society is necessary to achieve the SDGs in every context. At its heart, the SDGs are about global partnership for this call to action. No matter how large or small, and regardless of their industry, all companies can contribute to the SDGs through their sustainability and corporate social responsibility strategies, policies, and processes.

Figure 1-1: UN Sustainable Development Goals

Ireland has published a Sustainable Development Goals National Implementation Plan 2022-2024 to provide a whole-of-government approach to implementing these goals. Sustainable development, climate change and equity are intrinsically intertwined. Climate change impacts can be linked in one way or another to all 17 of the UN Sustainable Development Goals (SDGs). Climate action that considers co-impacts across other SDGs can increase efficiency, reduce costs and support early and ambitious climate action.

This CCIA report focuses primarily on the climate impacts of mitigation and adaptation actions. Identified actions align closely with the objectives of the following SDGs:

Table 1-3: Relevant SDGs

SDG	Goal	Description
	Ensure availability and sustainable management of water and sanitation for all.	Support efforts to achieve universal access to safe and affordable drinking water and sanitation for all.
	Ensure access to affordable, reliable, sustainable, and modern energy for all.	Support efforts to increase the share of renewable energy in the global energy mix; and, to promote investment in clean energy research, technology and infrastructure.
	Make cities and human settlements inclusive, safe, resilient, and sustainable.	Support efforts to enhance inclusive and sustainable urbanisation, and efforts to protect and safeguard the world's cultural and natural heritage. Ensure access for all to basic services including transport and water services.

SDG	Goal	Description
	Ensure sustainable consumption and production patterns.	Support efforts to achieve the environmentally sound management of all wastes throughout their life cycle, to significantly reduce their release to air, water, and soil, and to substantially reduce waste generation through prevention, reduction, recycling, and reuse.
	Take urgent action to combat climate change and its impacts.	Support efforts to strengthen resilience and adaptive capacity to climate-related hazards and natural disasters, and to integrate climate change measures into company policies, strategy, and planning.
	Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.	Support efforts to prevent and significantly reduce marine pollution of all kinds.
	Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.	Support efforts to ensure the conservation and sustainable use of terrestrial and inland freshwater ecosystems, efforts to halt deforestation and combat desertification, efforts to ensure the conservation of mountain ecosystems and reduce the degradation of natural habitats, and efforts to halt the loss of biodiversity and protect and prevent the extinction of threatened species

In Section 5 of this Report, the relevant policy objectives of the DLR CDP have been carefully considered in the context of the above-listed SDGs, and their incorporation into the Proposed Development design.

1.2.5 Mandatory Sustainability Reporting Considerations

1.2.5.1 Corporate Sustainability Reporting Directive (CSRD)

On 5 January 2023, the Corporate Sustainability Reporting Directive (CSRD) entered into force. It modernises and strengthens the rules concerning the social and environmental information that companies must report. The CSRD is effective from 01 January 2024 for those entities already subject to the NFRD (reporting in 2025) and from 01 January 2025 for all other large companies (reporting in 2026).

Companies subject to the CSRD will have to report according to European Sustainability Reporting Standards (ESRS). The standards are developed in a draft form by the EFRAG, previously known as the European Financial Reporting Advisory Group.

If the client falls in scope for CSRD, the results from this current Climate Change Impact Assessment Report should be reviewed in line with the materiality assessment and annual CSRD disclosure requirements. Specifically, the report and findings may serve as an evidence base for EFRAG Standard ESRS E1 CLIMATE CHANGE.

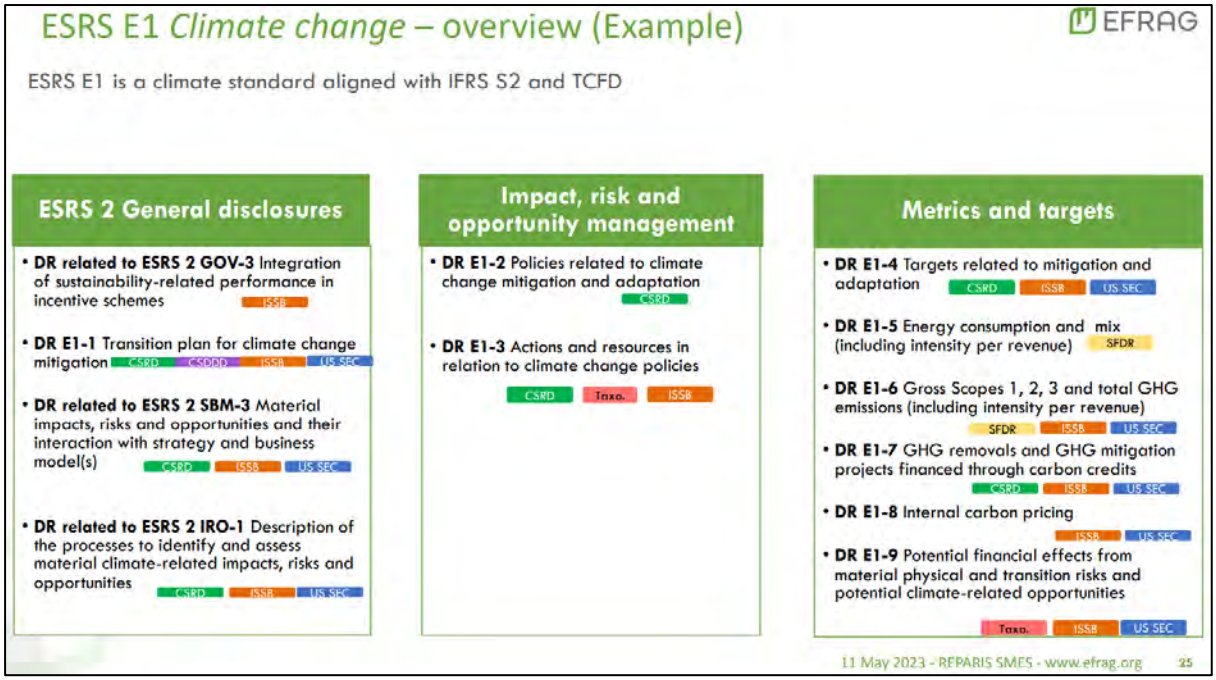

Figure 1-2: ESRS E1 Climate Change: presented by Eric Duvaud, EFRAG SR TEG member (Source: The first set of ESRS – the journey from PTF to delegated act (adopted on 31 July 2023) – EFRAG)

The data/information from this CCIA should be considered for Impact, Risk and Opportunity Management Disclosure Requirements 20 and 21 below within ESRS E1 CLIMATE CHANGE:

20. The undertaking shall describe the process to identify and assess climate-related impacts, risks and opportunities. This description shall include its process in relation to:

(a) impacts on climate change, in particular, the undertaking's GHG emissions (as required by Disclosure Requirement ESRS E1-6);

(b) climate-related physical risks in own operations and along the upstream and downstream value chain, in particular:

i. the identification of climate-related hazards, considering at least high emission climate scenarios; and

ii. the assessment of how its assets and business activities may be exposed and are sensitive to these climate-related hazards, creating gross physical risks for the undertaking.

(c) climate-related transition risks and opportunities in own operations and along the upstream and downstream value chain, in particular:

i. the identification of climate-related transition events, considering at least a climate scenario in line with limiting global warming to 1.5°C with no or limited overshoot; and

ii. the assessment of how its assets and business activities may be exposed to these climate-related transition events, creating gross transition risks or opportunities for the undertaking.

21. When disclosing the information required under paragraphs 20 (b) and 20 (c) the undertaking shall explain how it has used climate-related scenario analysis, including a range of climate scenarios, to inform the identification and assessment of physical risks and transition risks and opportunities over the short-, medium- and long-term.

Table 1-4 of this Report details the Impact, Risk and Opportunity Management Disclosure Requirements 20 and 21 within ESRS E1 CLIMATE CHANGE, and the associated sections of this Report in which these requirements have been addressed.

1.2.5.2 Corporate Sustainability Due Diligence Directive (CSDDD)

This proposed Directive establishes a corporate due diligence duty. The core elements of this duty are identifying, bringing to an end, preventing, mitigating and accounting for negative human rights and environmental impacts in the company's own operations, their subsidiaries and their value chains. In addition, certain large companies must have a plan to ensure that their business strategy is compatible with limiting global warming to 1.5 °C in line with the Paris Agreement.

The CSDDD is expected to complement the CSRD as it will require companies to implement comprehensive identification, prevention and mitigation processes to eliminate adverse human rights and environmental impacts in the company's own operations, its subsidiaries and value chains. It will also complement the Taxonomy Regulation that requires specific details of what constitute "environmentally sustainable" investments.

It is expected that the CSDDD will require companies in scope to ensure the identification, prevention, mitigation and ability to account for any adverse environmental impacts, with adequate governance, management systems and measures in place to this end.

For instance, regarding adverse climate change impacts, a company would have to obtain quantitative and qualitative information about baseline conditions at higher risk sites or facilities. Identification of adverse impacts would include assessing the environmental context in a dynamic way and at regular intervals, prior to a new activity or relationship; prior to major decisions or changes in the operation; in response to or anticipation of changes in the operating environment; and periodically (at least every 12 months) throughout the life of an activity or relationship. The following Climate Change Impact Assessment can serve as due diligence demonstrating partial compliance with the CSDDD.

1.2.6 Just Transition

The 2021 Climate Action Plan sets out a just transition framework consisting of four principles to underpin both processes and implementation of all climate action policies and measures. The present report primarily examines the impact of climate change. However, we recommend that due consideration be given to the concept of a "just transition," aligning with the Irish Government's framework, to ensure a comprehensive approach to addressing the climate crisis that extends beyond mere climate action.

The just transition framework is made up of four principles:

1. An integrated, structured, and evidence-based approach to identify and plan our response to just transition requirements.
2. People are equipped with the right skills to be able to participate in and benefit from the future net zero economy.

3. The costs are shared so that the impact is equitable and existing inequalities are not exacerbated.
4. Social dialogue to ensure impacted citizens and communities are empowered and are core to the transition process.

1.2.7 Nature

The close relationship between climate and nature emphasises the need for coordinated action that addresses both. While it remains beyond the scope of the current CCIA report, we reiterate our recommendation to consider the impacts of climate and nature in tandem, rather than separately.

Ireland's 4th National Biodiversity Action Plan (NBAP) sets the national biodiversity agenda for the period 2023-2030 and aims to deliver the transformative changes required to the ways in which we value and protect nature. Ireland's planning system has an important role in safeguarding biodiversity by ensuring that new development is sustainable and does not have a negative impact on the environment. The Irish NBAP underscores that there are opportunities to deliver for biodiversity in the assessment of new planning applications, as well as the application of best-practice principles for urban design and landscape management, such as green infrastructure and nature-based solutions.

The NBAP will continue to implement actions within the framework of five strategic objectives, while addressing new and emerging issues:

- Objective 1 - Adopt a Whole of Government, Whole of Society Approach to Biodiversity
- Objective 2 - Meet Urgent Conservation and Restoration Needs
- Objective 3 - Secure Nature's Contribution to People
- Objective 4 - Enhance the Evidence Base for Action on Biodiversity
- Objective 5 - Strengthen Ireland's Contribution to International Biodiversity Initiatives

Local Biodiversity Action Plans (LBAP) further support the objectives of the NBAP and so should also be consulted to identify biodiversity objectives, targets, guidelines for the lifecycle of the proposed development.

Nature acts as a vital regulator of climate, while climate change threatens biodiversity and ecosystem health. To combat these challenges effectively, climate action must integrate efforts to conserve and restore natural ecosystems. By doing so, we can mitigate climate change impacts and protect biodiversity, ensuring a more resilient and sustainable future.

In June 2024, the EU Council formally adopted the Nature Restoration Law. Under the Nature Restoration Law, EU member states will need to restore at least 30% of habitats in poor condition by 2030, 60% by 2040, and 90% by 2050. The regulation sets out specific requirements for different types of ecosystems, including agricultural land, forests, and urban ecosystems. Increasing forest birds' population and making sure there is no net loss on urban green spaces and tree canopy cover until end of 2030 are also key measures of this new law. The regulation will now be published in the EU's Official Journal and enter into force. It will become directly applicable in all member states and specific targets for each sector are likely.

Table 1-4: ESRS E1 Climate Change Requirements

ESRS E1 Climate Change Requirements[6]		Relevant Section of this Report
20. The undertaking shall describe the process to identify and assess climate-related impacts, risks and opportunities. This description shall include its process in relation to:	(a) impacts on climate change, in particular, the undertaking's GHG emissions (as required by Disclosure Requirement ESRS E1-6);	A number of strategies have been outlined in Section 4.3 of this report which will be adopted within the development to maximise low energy use, promote circular waste management, and reduce carbon emissions. Quantification of the Proposed Development's GHG emissions is outside the scope of this assessment.
	(b) climate-related physical risks in own operations and along the upstream and downstream value chain, in particular: (i) the identification of climate-related hazards, considering at least high emission climate scenarios; and (ii) the assessment of how its assets and business activities may be exposed and are sensitive to these climate-related hazards, creating gross physical risks for the undertaking.	See Section 3 of this Report for a Climate Risk Screening which identifies material climate-related hazards based on both intermediate and high-emission scenarios. See Section 4 of this Report for a Climate Risk and Vulnerability Assessment which evaluates these climate-related hazards, the risk factors (Exposure), the current sensitivity and adaptive capacity of the development (Vulnerability), and the subsequent risk level.
	(c) climate-related transition risks and opportunities in own operations and along the upstream and downstream value chain, in particular: (i) the identification of climate-related transition events, considering at least a climate scenario in line with limiting global warming to 1.5°C with no or limited overshoot; and	The Dún Laoghaire-Rathdown County Development Plan 2022-2028 includes a robust framework of policies and objectives aimed at driving climate-related transitions. These measures are designed to promote sustainability, reduce emissions, enhance

[6] as set out in the Draft European Sustainability Reporting Standards (ESRS) by the EFRAG (previously known as the European Financial Reporting Advisory Group).

ESRS E1 Climate Change Requirements[6]		Relevant Section of this Report
	(ii) the assessment of how its assets and business activities may be exposed to these climate-related transition events, creating gross transition risks or opportunities for the undertaking.	resilience, and ensure that the county contributes effectively to national and international climate goals. See Section 5 of this report for Dún Laoghaire-Rathdown County Development Plan 2022-2028: Relevant Policies and Objectives and how these have been considered in the current proposal.
21. When disclosing the information required under paragraphs 20 (b) and 20 (c) the undertaking shall explain how it has used climate-related scenario analysis, including a range of climate scenarios, to inform the identification and assessment of physical risks and transition risks and opportunities over the short-, medium- and long-term.		See Section 2 of this Report for Climate Change Projections which includes a climate-related scenario analysis.

2 CLIMATE CHANGE PROJECTIONS

The Supplementing Regulation establishes the Technical Screening Criteria specific to certain economic activities. Annex II, Section 7.1 of the Supplementing Regulation ('the construction of new buildings') includes specific requirements relating to climate projections:

2. The climate risk and vulnerability assessment is proportionate to the scale of the activity and its expected lifespan, such that:

(a) for activities with an expected lifespan of less than 10 years, the assessment is performed, at least by using climate projections at the smallest appropriate scale;

(b) for all other activities, the assessment is performed using the highest available resolution, state-of-the-art climate projections across the existing range of future scenarios consistent with the expected lifetime of the activity, including, at least, 10-to-30-year climate projections scenarios for major investment.

3. The climate projections and assessment of impacts are based on best practice and available guidance and take into account the state-of-the-art science for vulnerability and risk analysis and related methodologies in line with the most recent Intergovernmental Panel on Climate Change reports, scientific peer-reviewed publications and open source or paying models.

The current assessment has utilised climate projections from IPCC AR6 WGI and the IPCC WGI online Interactive Atlas for Northern Europe; and *Climate Ireland* Climate Change Projection Maps[7] in combination with EPA Research Report No. 339[8]. Due to the expected lifespan of the Proposed Development, climate projections have been provided for mid-term and long-term periods (2041–2060, 2041-2070, and 2081–2100).

A new set of illustrative scenarios have been developed by the IPCC AR6 WGI which cover the range of possible future developments of anthropogenic drivers of climate change found in literature, derived from the Shared Socio-economic Pathways (SSPs). Concentration trajectories known as Representative Concentration Pathways (RCPs) were utilised in EPA Research Report No.339. These RCPs were considered by the IPCC in their Fifth Assessment Report (AR5). For this study, intermediate (SSP2-4.5 and RCP4.5) and very high (SSP5-8.5 and RCP8.5) GHG emissions scenarios were utilised in both the medium and long-term periods; this is considered a conservative assumption of future GHG emission paths. These scenarios are detailed in the following Sections.

All "climate-related hazards" have been classified as either "chronic" or "acute". Chronic effects are gradual slow onset developments (e.g., long term rise in mean annual air temperature); whereas acute effects are rapidly developing climate extremes and/or increased variability (e.g., heatwaves).

[7] Climate Ireland - Climate Change Projection Maps.

[8] P. Nolan and J. Flanagan (2020) High-Resolution Climate Projections for Ireland – a Multi-model Ensemble Approach. EPA Research Report No. 339.

2.1 Overview of Climate Modelling

With increasing atmospheric greenhouse gas concentrations driving changes in all aspects of the climate system, climate change is representing an urgent and potentially irreversible threat to human societies globally. Accurate climate projections are a key scientific input for national policymakers when planning for, and adapting to, the challenges posed by climate change.

Climate projections are produced using climate models, which have been developed by scientists over recent decades and are capable of simulating Earth's past, present, and future climate. Global Climate Models (GCMs) are used to model the global impacts on Earth's climate of increasing greenhouse gas concentrations in the atmosphere at a resolution of ~50km or coarser. Regional Climate Models (RCMs) are used to capture key small-scale atmospheric features on the scale of 1-10km, such as local convection and wind gusts. Multi-model ensembles are often used in climate prediction studies to quantify associated model uncertainty.

RCMs utilise the output of GCMs and model regional climates at higher spatial resolutions; this process is known as dynamic downscaling. This approach allows key climate variables to be modelled more precisely, including precipitation; near-surface temperature; and the number and intensity of low-pressure systems. Low pressure systems are the primary driver of precipitation and wind affecting the country; therefore, the added value of RCMs in the modelling of low-pressure systems is of particular importance for Ireland.

Future greenhouse gas concentrations in the atmosphere are also uncertain. To model possible future climate change, varying greenhouse gas concentrations over time are needed as a GCM input. The core set of SSP scenarios used in the AR6 WGI report cover a broad range of emissions pathways, including new low-emissions pathways. They start in 2015 and include scenarios with high and very high greenhouse gas (GHG) emissions (SSP3-7.0 and SSP5-8.5) and CO_2 emissions that roughly double from current levels by 2100 and 2050, respectively; scenarios with intermediate GHG emissions (SSP2-4.5) and CO_2 emissions remaining around current levels until the middle of the century; and scenarios with very low and low GHG emissions and CO_2 emissions declining to net zero around or after 2050, followed by varying levels of net negative CO_2 emissions (SSP1-1.9, SSP1-2.6).

Concentration trajectories known as Representative Concentration Pathways (RCPs) were utilised in EPA Research Report No.339. These RCPs were considered by the IPCC in their Fifth Assessment Report (AR5) and include the following four scenarios: RCP2.6, RCP4.5, RCP6 and RCP8.5. For the EPA study, two RCPs were chosen, RCP4.5 and RCP8.5. RCP4.5 is considered an intermediate scenario, while RCP8.5 is considered to be representative of a potential worst-case scenario.

Figure 2-1 illustrates the future annual emissions of CO_2 and of a subset of key non-CO_2 drivers, across the latest five illustrative scenarios developed by the IPCC:

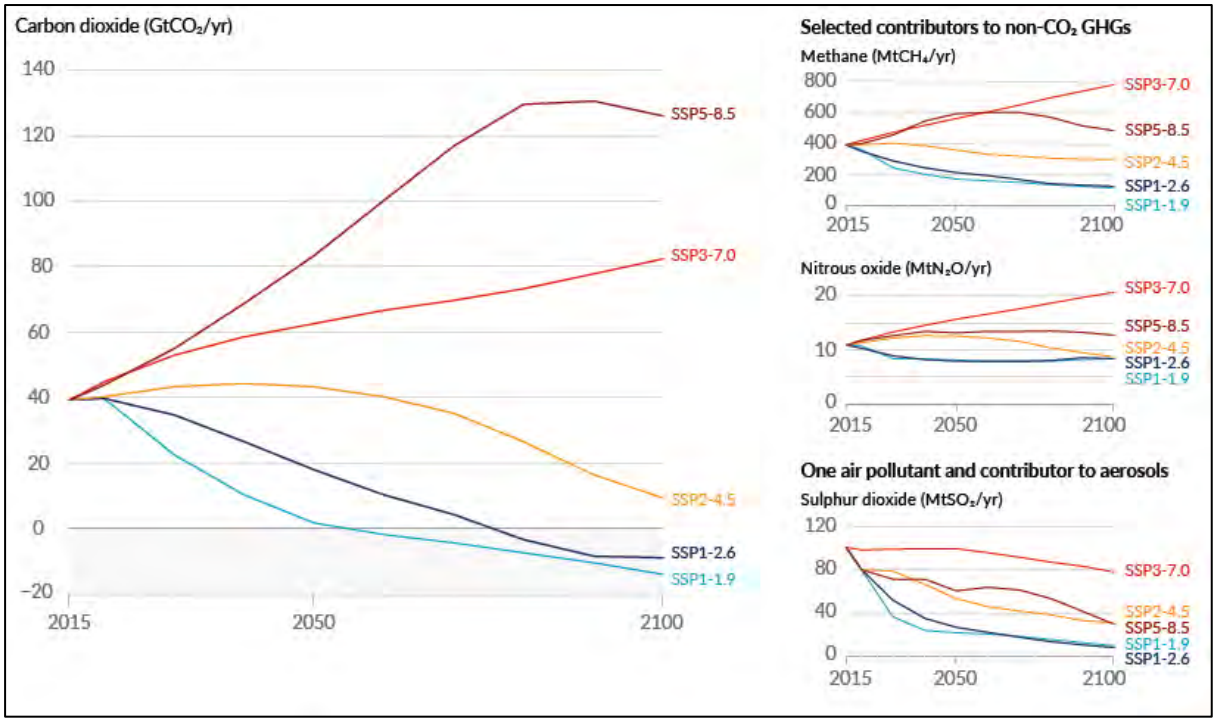

Figure 2-1: Future annual emissions of CO_2 (left) and of a subset of key non-CO_2 drivers (right), across five illustrative scenarios (source: adapted from IPCC AR6 WGI Summary for Policy Makers)

Figure 2-2 illustrates the global surface temperature change relative to 1850-1900 under each scenario:

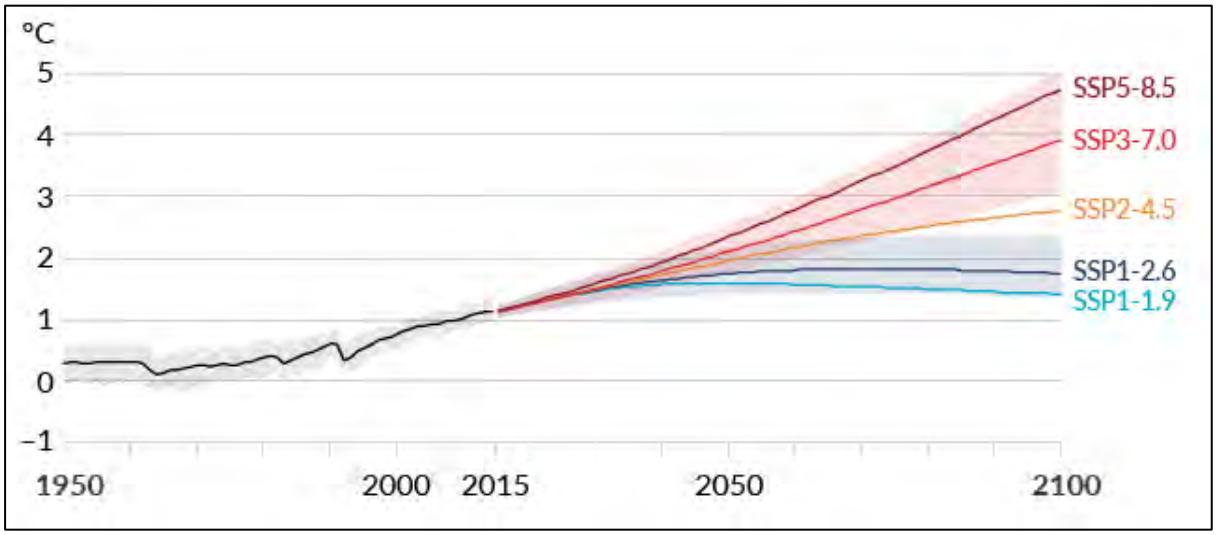

Figure 2-2: global surface temperature change relative to 1850-1900 (source: adapted from IPCC AR6 WGI Summary for Policy Makers)

2.2 IPCC AR6 WGI Regional Climate Projections

IPCC AR6 WGI assesses the current evidence on the physical science of climate change, evaluating knowledge gained from observations, reanalyses, paleoclimate archives and climate model simulations, as well as physical, chemical, and biological climate processes.

The WGI contribution to AR6 is focused on physical and biogeochemical climate science information, with particular emphasis on regional climate changes.

According to IPCC AR6 WGI, sustained changes have been documented in all major elements of the climate system, including the atmosphere, land, cryosphere, biosphere and ocean. Multiple lines of evidence indicate the unprecedented nature of recent largescale climatic changes in the context of all human history. The key findings of the WGI contribution to AR6 are as follows:

- It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred;

- Global surface temperature will continue to increase until at least mid-century under all emissions scenarios considered. Global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO_2 and other greenhouse gas emissions occur in the coming decades;

- Observed increases in well-mixed greenhouse gas (GHG) concentrations since around 1750 are unequivocally caused by human activities;

- Each of the last four decades has been successively warmer than any decade that preceded it since 1850;

- The likely range of total human-caused global surface temperature increase from 1850–1900 to 2010–2019 is 0.8°C to 1.3°C, with a best estimate of 1.07°C;

- Globally averaged precipitation over land has likely increased since 1950, with a faster rate of increase since the 1980s;

- It is virtually certain that the global upper ocean (0–700 m) has warmed since the 1970s and extremely likely that human influence is the main driver;

- Global mean sea level increased by 0.20 [0.15 to 0.25] m between 1901 and 2018. The average rate of sea level rise was 1.3 [0.6 to 2.1] mm/year between 1901 and 1971, increasing to 1.9 [0.8 to 2.9] mm/year between 1971 and 2006, and further increasing to 3.7 [3.2 to 4.2] mm/year between 2006 and 2018.

Key model intercomparisons supporting AR6 include the Coupled Model Intercomparison Project Phase 6 (CMIP6) and the Coordinated Regional Climate Downscaling Experiment (CORDEX), for global and regional models respectively. Results using CMIP Phase 5 (CMIP5) simulations are also assessed. Since AR5, large ensemble simulations, where individual models perform multiple simulations with the same climate forcings, are increasingly used to inform understanding of the relative roles of internal variability and forced change in the climate system, especially on regional scales. The broader availability of ensemble model simulations has contributed to better estimations of uncertainty in projections of future change.

Chapter 12 of IPCC AR6 WGI and the online Interactive Atlas have been utilised in this assessment to summarise climate projections and conduct a detailed inspection of projected changes in climate for the region of the Proposed Development. Chapter 12 of IPCC AR6 WGI provides a comprehensive, region-specific assessment of changing climatic conditions that may be hazardous or favourable for various sectors. The online Interactive Atlas is an online tool that complements the WGI Report by providing flexible temporal and spatial analyses of trends and changes in key atmospheric and oceanic variables, extreme indices and climatic impact-drivers (CIDs), as obtained from several global and regional observational and model simulated datasets used in the report. The Interactive Atlas presents detailed projected global and regional climate changes at near-, mid- and long-term periods, 2021–2040, 2041–2060 and 2081–2100, respectively, for a range of emissions scenarios. Within the Interactive Atlas, spatially aggregated regional information is provided for different predefined sets of regions:

- The sub-continental AR6 WGI reference regions;
- WG II continental regions;
- Monsoon regions;
- Major river basins;
- Small-island regions;
- Ocean biological activity regions.

Under the sub-continental AR6 WGI reference regions, Europe is divided into four climatic regions: Northern Europe (NEU), Western and Central Europe (WCE), Eastern Europe (EEU) and Mediterranean (MED). Ireland is part of NEU, therefore aggregated climate information for this region has been derived for this assessment and is summarised in the following Table 2-1.

The IPCC AR6 WGI describe “climate related hazards” as Climatic Impact Drivers (CID). CIDs are defined by the IPCC as physical climate system conditions (e.g., means, events, extremes) that can be directly connected with having impacts on human or ecological systems. This terminology has been retained in this assessment.

In the following Table 2-1, a summary of projections for NEU has been provided for each CID along with detailed climate projection data, sourced using the WGI online Interactive Atlas. The detailed projections provide the median and 25th to 75th percentile range for each variable under the intermediate (SSP2-4.5) and very high (SSP5-8.5) GHG emissions scenarios in both the medium and long-term periods. In some cases, Atlas data was not available for certain variables; IPCC AR6 WGI summary findings were used to supplement in this case.

Table 2-1: Climate Projections for Northern Europe (Data Source: IPCC AR6 & IPCC WGI online Interactive Atlas)

IPCC Climate Impact Driver Category	IPCC Climate Impact Driver (CID) / Climate-related hazard	IPCC AR6 Summary Findings[9]	IPCC WGI Interactive Atlas Data[10] (SSP2-4.5 Scenario)[11]	IPCC WGI Interactive Atlas Data[12] (SSP5-8.5 Scenario)[13]
Heat and Cold	Temperature Projections (Chronic)	Since AR5, studies have confirmed that the mean warming trend in Europe is increasing. Irrespective of the scenario, it is virtually certain that warming will continue in Europe, and there is high confidence[14] that the observed increase in heat extremes is due to human activities. All temperature trends are very likely to continue for a global warming level (GWL) of 1.5°C or 2°C and 3°C.	**Increase in mean temperature in Medium Term (2041-2060):** Median: +1.5ºC P25-P75: +1.2ºC to +1.9ºC **Increase in mean temperature in Long Term (2081-2100):** Median: +2.4ºC P25-P75: +1.8ºC to +3.0ºC	**Increase in mean temperature in Medium Term (2041-2060):** Median: +2.0ºC P25-P75: +1.5ºC to +2.5ºC **Increase in mean temperature in Long Term (2081-2100):** Median: +4.4ºC P25-P75: +3.6ºC to +5.5ºC
	Heatwave (Acute)	The frequency of heatwaves observed in Europe has very likely increased in recent decades due to human-induced change in atmospheric composition. It is very likely that the frequency of heatwaves will increase during the 21st century regardless of the emissions scenario in each European region, and for 1.5°C and 2°C GWLs.	**Increase in number of days with a maximum temperature above 35ºC in Medium Term (2041-2060):** Median: 0.1 P25-P75: 0 to 0.1 **Increase in number of days with a maximum temperature above 35ºC in Long Term (2081-2100):**	**Increase in number of days with a maximum temperature above 35ºC in Medium Term (2041-2060):** Median: 0.1 P25-P75: 0 to 0.1 **Increase in number of days with a maximum temperature above 35ºC in Long Term (2081-2100):**

[9] Working Group I contribution to the Sixth Assessment Report, Climate Change 2021: The Physical Science Basis. Chapter 12: Climate Change Information for Regional Impact and for Risk Assessment.

[10] IPCC WGI online Interactive Atlas Parameters: Model projection CMIP6; SSP2-2.4 Scenario; Annual; Relative to 1995-2014 Baseline.

[11] This is a "middle of the road" scenario. CO_2 emissions hover around current levels before starting to fall mid-century, but do not reach net-zero by 2100.

[12] IPCC WGI online Interactive Atlas Parameters: Model projection CMIP6; SSP5-8.5 Scenario; Annual; Relative to 1995-2014 Baseline.

[13] This represents the high end of the range of future pathways. CO_2 emissions triple by 2075.

14 Confidence is a qualitative measure of the validity of a finding, based on the type, amount, quality and consistency of evidence (e.g., data, mechanistic understanding, theory, models, expert judgment) and the degree of agreement.

IPCC Climate Impact Driver Category	IPCC Climate Impact Driver (CID) / Climate-related hazard	IPCC AR6 Summary Findings[9]	IPCC WGI Interactive Atlas Data[10] (SSP2-4.5 Scenario)[11]	IPCC WGI Interactive Atlas Data[12] (SSP5-8.5 Scenario)[13]
			Median: 0.1 P25-P75: 0 to 0.2	Median: 0.5 P25-P75: 0.1 to 0.7
	Frost days (Acute)	The frequency of frost days will very likely decrease for all scenarios and all time-horizons with consequences for agriculture and forests. A simple heating degree day index, characterizing heating demand, shows a large observed decreasing trend for winter heating energy demand in Europe. This trend is very likely to continue through the 21st century, with decreases in the range of 20–30% for Northern Europe.	**Decrease in number of frost days in Medium Term (2041-2060):** Median: -19.8 P25-P75: -28.5 to -12.5 **Decrease in number of frost days in Long Term (2081-2100):** Median: -32.6 P25-P75: -39.2 to -26.4	**Decrease in number of frost days in Medium Term (2041-2060):** Median: -27.6 P25-P75: -35.3 to -20.9 **Decrease in number of frost days in Long Term (2081-2100):** Median: -57 P25-P75: -64.5 to -46.8
Wet and Dry	Precipitation (Chronic)	Precipitation has generally increased in northern Europe. It is very likely that precipitation will increase in Northern Europe in December, January, and February under all climate scenarios except RCP2.6[15]/SSP1-2.6 and for both mid- and end-century periods.	**Increase in total precipitation in Medium Term (2041-2060):** Median: 3.3% P25-P75: 1.8% to 4.9% **Increase in total precipitation in Long Term (2081-2100):** Median: 4.9% P25-P75: 2.3% to 7.6%	**Increase in total precipitation in Medium Term (2041-2060):** Median: 4.6% P25-P75: 2.5% to 7.1% **Increase in total precipitation in Long Term (2081-2100):** Median: 10.3% P25-P75: 7.8% to 13.7%
	River Flood Heavy Precipitation and Pluvial Flood (Acute)		**Increase in maximum 1-day precipitation amount in Medium Term (2041-2060):** Median: 5.9% P25-P75: 4.0% to 7.8%	**Increase in maximum 1-day precipitation amount in Medium Term (2041-2060):** Median: 8.3% P25-P75: 6.0% to 9.5%

[15] RCP 2.6 is a "very stringent" pathway. RCP 2.6 is likely to keep global temperature rise below 2°C by 2100.

IPCC Climate Impact Driver Category	IPCC Climate Impact Driver (CID) / Climate-related hazard	IPCC AR6 Summary Findings[9]	IPCC WGI Interactive Atlas Data[10] (SSP2-4.5 Scenario)[11]	IPCC WGI Interactive Atlas Data[12] (SSP5-8.5 Scenario)[13]
		There is medium confidence that river floods will decrease in Northern Europe under RCP8.5[16] and low confidence under RCP2.6. Heavy precipitation frequency trends have been detected and attributed to climate change in with high confidence in Northern Europe.	**Increase in maximum 1-day precipitation amount in Long Term (2081-2100):** Median: 10.3% P25-P75: 6.3% to 13.9%	**Increase in maximum 1-day precipitation amount in Long Term (2081-2100):** Median: 20.2% P25-P75: 14.1% to 24.1%
			Increase in maximum 5-day precipitation amount in Medium Term (2041-2060): Median: 4.7% P25-P75: 3.5% to 6.1% **Increase in maximum 5-day precipitation amount in Long Term (2081-2100):** Median: 8.2% P25-P75: 4.7% to 11.2%	**Increase in maximum 5-day precipitation amount in Medium Term (2041-2060):** Median: 6.5% P25-P75: 4.3% to 8.9% **Increase in maximum 5-day precipitation amount in Long Term (2081-2100):** Median: 16.2% P25-P75: 12% to 20.6%
	Drought (Acute)	Higher precipitation that outweighs the effects of increased evapotranspiration is expected to result in a decrease in streamflow drought frequency in Northern Europe. A reduction of drought length and magnitude is projected for Northern Europe.	**Likely increase in number of consecutive dry days in Medium Term (2041-2060):** Median: 0.2 P25-P75: -0.1 to 0.7 **Increase in number of consecutive dry days in Long Term (2081-2100):** Median: 0.6	**Likely increase in number of consecutive dry days in Medium Term (2041-2060):** Median: 0.3 P25-P75: -0.1 to 0.7 **Increase in number of consecutive dry days in Long Term (2081-2100):** Median: 1.4

16 In RCP 8.5 emissions continue to rise throughout the 21st century. This high-emissions scenario is frequently referred to as “business as usual”, suggesting that is a likely outcome if society does not make concerted efforts to cut greenhouse gas emissions.

IPCC Climate Impact Driver Category	IPCC Climate Impact Driver (CID) / Climate-related hazard	IPCC AR6 Summary Findings[9]	IPCC WGI Interactive Atlas Data[10] (SSP2-4.5 Scenario)[11]	IPCC WGI Interactive Atlas Data[12] (SSP5-8.5 Scenario)[13]
			P25-P75: 0.1 to 0.11	P25-P75: 0.6 to 2.1
Wind	Surface Wind Speed (Chronic)	There is medium confidence that mean surface wind speeds have decreased in Europe as in many other areas of the Northern Hemisphere over the past four decades. Under RCP4.5[17] and RCP8.5 scenarios, projections indicate a decrease in mean wind speed in Northern Europe (medium confidence).	**Negligible change in mean surface windspeed in Medium Term (2041-2060):** Median: -0.8% P25-P75: -1.7% to 0.2% **Decrease in mean surface windspeed in Long Term (2081-2100):** Median: -1.9% P25-P75: -2.9% to -1.2%	**Decrease in mean surface windspeed in Medium Term (2041-2060):** Median: -1.1% P25-P75: -1.6% to -0.5% **Decrease in mean surface windspeed Long Term (2081-2100):** Median: -2.8% P25-P75: -4.5% to -1.2%
	Severe Windstorms (Acute)	There are large uncertainties in past evolutions of windstorms and extreme winds in Europe. Extreme near-surface winds have been decreasing in the past decades according to near-surface observations. Strong winds and extratropical storms are projected to have a slightly increasing frequency and amplitude in the future in Northern Europe.	*No atlas data available for severe windstorms.*	
Snow and Ice	Snowfall (Chronic)	Widespread and accelerated declines in snow depth and snow water equivalent have been observed in Europe. There is high confidence that future snow cover extent and seasonal duration will reduce.	**Decrease in snowfall (mm/day) in Medium Term (2041-2060):** Median: -2.8	**Decrease in snowfall (mm/day) in Medium Term (2041-2060):** Median: -3.9

[17] RCP 4.5 is described by the IPCC as an intermediate scenario. Emissions in RCP 4.5 peak around 2040, then decline. It is a scenario of long-term, global emissions of greenhouse gases, short-lived species, and land-use-landcover which stabilizes radiative forcing at 4.5 Watts per meter squared (W m^2, approximately 650 ppm CO_2-equivalent) in the year 2100 without ever exceeding that value.

IPCC Climate Impact Driver Category	IPCC Climate Impact Driver (CID) / Climate-related hazard	IPCC AR6 Summary Findings[9]	IPCC WGI Interactive Atlas Data[10] (SSP2-4.5 Scenario)[11]	IPCC WGI Interactive Atlas Data[12] (SSP5-8.5 Scenario)[13]
			P25-P75: -4.0 to -1.8 **Decrease in snowfall (mm/day) in Long Term (2081-2100):** Median: -4.8 P25-P75: -5.6 to -3.7	P25-P75: -5.0 to -2.6 **Decrease in snowfall (mm/day) in Long Term (2081-2100):** Median: -7.9 P25-P75: -9.6 to -6.2
	Heavy snowfall, ice storms and hail (Acute)	There is low confidence that climate change will affect ice and snow-related episodic hazards (limited evidence).	*No atlas data available for heavy snowfall, ice storms and hail.*	
Coastal and Oceanic	Sea level rise (Acute)	Relative sea level rise is extremely likely to continue in the oceans around Europe.	**Increase in sea level (metres) in Medium Term (2041-2060):** Median: 0.2 P25-P75: 0.1 to 0.3 **Increase in sea level (metres) in Long Term (2081-2100):** Median: 0.4 P25-P75: 0.2 to 0.5	**Increase in sea level (metres) in Medium Term (2041-2060):** Median: 0.2 P25-P75: 0.1 to 0.3 **Increase in sea level (metres) in Long Term (2081-2100):** Median: 0.5 P25-P75: 0.3 to 0.7
	Coastal flooding (Chronic)	Relative sea level rise is extremely likely to continue around Europe, contributing to increased coastal flooding in low-lying areas. The present-day 1-in-100-year extreme total water level (ETWL) is between 2.5 and 5.0 m around the UK. There is high confidence that extreme total water level (ETWL) magnitude and occurrence frequency will increase throughout Europe. Under RCP4.5, the present day 1-in-100-year ETWL is projected to have median return periods of between 1-in-20-years and	*No atlas data available for coastal flooding.*	

IPCC Climate Impact Driver Category	IPCC Climate Impact Driver (CID) / Climate-related hazard	IPCC AR6 Summary Findings[9]	IPCC WGI Interactive Atlas Data[10] (SSP2-4.5 Scenario)[11]	IPCC WGI Interactive Atlas Data[12] (SSP5-8.5 Scenario)[13]
		1-in-50-years by 2050 and between 1-in-5-years and 1-in-20-years by 2100.		
Other	Compound events	One typical compound event that is observed in the European area is compound flooding due to the combination of extreme sea level events and extreme precipitation events associated with high levels of runoff. Under RCP8.5, the probability of these events is projected to increase along northern European coasts, with the percentage of coastline now experiencing such events at least once every 6 years increasing by between 3% and 11% by the end of the 21st century. Compound events of dry and hot summers have increased in Europe. The probability of such compound events has increased across much of Europe between 1950–1979 and 1984–2013. Compound hot and dry extremes are projected to increase in Europe by mid-century for the Special Report on Emission Scenarios (SRES) A1B and RCP8.5 scenarios.	*No atlas data available for compound events.*	

2.3 Other Relevant Scientific Based Climate Predictions

2.3.1 TRANSLATE: One Climate Resource for Ireland

The TRANSLATE project is a Met Éireann lead initiative to standardise future climate projections for Ireland and develop climate services that meet the climate information needs of decision makers. It is a collaborative effort led by climate researchers from University of Galway – Irish Centre for High End Computing (ICHEC), and University College Cork – SFI Research Centre for Energy, Climate and Marine (MaREI), supported by Met Éireann climatologists.

TRANSLATE focuses on reviewing existing climate models to produce a national set of standardised climate projections. Climate services are then developed from these standardised climate projections to aid climate risk decision making across multiple sectors (for example, transport, energy, water). Climate services can be described as a set of services that communicate climate science data/information into products (for example, indices, risk assessments, uncertainty estimates) tailored to meet climate sensitive decision makers.

TRANSLATE's outputs are produced using a selection of internationally reviewed and accepted models from both CORDEX and high-resolution regional projections produced by ICHEC. Together they demonstrate a range of possible futures for Ireland based on assumptions of global human activity resulting in "least", "more" or "most" climate change. Historical climate data is evaluated against the observational record and corrected to remove any model bias. This correction is then applied to all future data. This allows information to be presented on how the variables change (difference) as well as actual values (absolute).

2.3.1.1 Climate Ireland – Climate Change Projection Maps

Climate Ireland is Ireland’s national adaptation platform and is provided by the Environmental Protection Agency as part of the EPA's climate adaptation work.

The Climate Change Projection Maps viewer has been developed to understand current and projected future climate conditions for Ireland. Observed Climate Information is based on TRANSLATE and Climate Change Projections are based on TRANSLATE along with EPA Research Report No. 339[18] for some variables.

The Climate Data Explorer provides three types of climate information:

- Observed Climate Information: average historical climate data on variables including temperature and precipitation for the period 1976-2005.
- Climate Change Projections (standardised and bias-corrected): future projections of changes for variables such as temperature and precipitation for a selection of time periods, scenarios and global warming levels (from Met Éireann's TRANSLATE project - O'Brien and Nolan (2023)).

[18] P. Nolan and J. Flanagan (2020) High-Resolution Climate Projections for Ireland – a Multi-model Ensemble Approach. EPA Research Report No. 339.

- Climate Change Projections (non-standardised): future projections of changes for variables such as snowfall, driving rain and wind energy for the period 2041-2060 (these projections come from Nolan and Flanagan (2020) and are compared to 1981-2000, rather than the TRANSLATE parameters). As further results come from standardised projects these maps will be replaced.

2.3.1.2 EPA Climate Projections

The EPA's Research Report on Climate Projections for Ireland (Research Report No. 339)[19] employs regional climate modelling to assess the impacts of a warming climate on the 21st-century climate of Ireland. Regional climate models (RCMs) take the outputs from global climate models (GCMs) to produce more refined projections of the potential local and regional impacts of climate change. The RCM simulations were run at high spatial resolution (3.8km and 4km) which allowed for a more realistic representation of important physical processes and enabling a more accurate evaluation of the local impacts of climate change across Ireland.

A multi-model ensemble approach was employed in the study to address the issue of uncertainty. Through the ensemble approach, the uncertainty in the projections can be partly quantified, thus providing a measure of confidence in the projections. Different RCMs were used to downscale outputs from a number of different CMIP5 (Coupled Model Intercomparison Project – Phase 5) GCMs.

Simulations were run for the reference period 1981–2000 and the future period 2041–2060. Differences between the two periods provide a measure of climate change. To account for the uncertainty in future greenhouse gas emissions and changing land use, and how the world will come together to respond to the challenge of climate change, the future climate was simulated under both the Representative Concentration Pathway 4.5 (RCP4.5) and RCP8.5 scenarios. The climate projections of EPA Research Report No. 339 are in broad agreement with previous research, which adds a measure of confidence to the projections.

2.3.2 Ireland's Changing Climate

Ireland's climate is changing in line with global trends, with a temperature increase of, on average, 0.8°C compared with 1900. By the middle of this century (2041 – 2060) the average annual temperatures are projected to increase by between 1–1.2℃ and 1.3–1.6℃ depending on the emissions trajectory. The number of warm days is expected to increase and heat waves are expected to occur more frequently.

Ireland has seen an increase in average annual national rainfall of approximately 60mm or 5% in the period 1981-2010, compared to the 30- year period 1961-1990. Significant reductions are expected in average levels of annual, spring and summer rainfall. Projections indicate a substantial increase in the frequency of heavy precipitation events in Winter and Autumn (approx. 20%).

The rate of global sea level rise for 2006–2015 of 3.6 mm per year, is unprecedented over the last century, and about 2.5 times the rate for 1901–1990. Sea level is projected to continue to

[19] P. Nolan and J. Flanagan (2020) High-Resolution Climate Projections for Ireland – a Multi-model Ensemble Approach. EPA Research Report No. 339.

rise at this rate or greater. All major cities in Ireland are in coastal locations subject to tides, any significant rise in sea levels will have major economic, social and environmental impacts. Rising sea levels around Ireland would result in increased coastal erosion, flooding and damage to property and infrastructure.

Other climate change indicators include the following:

- The last five-year (2015–2019) and ten-year (2010–2019) average temperatures are the warmest on record. Since the 1980s, each successive decade has been warmer than any preceding decade since 1850.
- In Ireland, 2019 was the ninth consecutive year with temperatures above normal.
- Ireland has seen a reduction in the number of frost days and shortening of length of the frost season.
- The number of very intense storms is projected to increase over the North Atlantic region. Projections suggest that the winter track of these storms may extend further south and over Ireland more often.
- Sea surface temperature in Irish waters has increased at a rate of approximately 0.6°C per decade since 1994, which is unprecedented in the 150-year observational record.

The climate projections for the next century indicate that observed climate trends will continue and intensify over the coming decades. Predicted impacts include:

- Changes in wind speeds and storm tracks;
- Increased likelihood of river and coastal flooding;
- Changes in distribution of plant and animal species and in the phenology (the timing of lifecycle events) of native species;
- Water stress for crops, pressure on water supply and adverse impacts on water quality;
- Negative impacts on human health and wellbeing.

Adaptation refers to actions taken to reduce vulnerability and exposure to climate change impacts. The more we reduce global emissions, the less adaptation to the consequences of climate change will be required. However, some impacts are already unavoidable.

The following Table 2-2 provides a summary of climate projections for Ireland and specific climate model simulations for Dun Laoghaire County Council using a combination of the *Climate Ireland* Climate Change Projection Maps[20] and EPA Research Report No. 339[21]. For

[20] Climate Ireland - Climate Change Projection Maps.

[21] P. Nolan and J. Flanagan (2020) High-Resolution Climate Projections for Ireland – a Multi-model Ensemble Approach. EPA Research Report No. 339.

the purposes of this report, the climate variables observed have been determined as “climate-related hazards” and have been grouped according to the IPCC CID Categories.

Climate projections were obtained for the future periods 2041-2060 and 2041-2070. The reference periods have been set at 1976-2005 and 1980-2000. Differences between the reference periods and future periods provide a measure of climate change. The climate scenarios utilised in the assessment are RCP4.5 and RCP8.5

Table 2-2: Climate Projections for Ireland and Dublin (Data Source: Climate Ireland Climate Change Projection Maps)

IPCC Climate Impact Driver Category	Climate-related Hazard	Summary of Projections for Ireland[22]	Climate Model Simulations for Dublin[23] (RCP4.5 Scenario)	Climate Model Simulations for Dublin[23] (RCP8.5 Scenario)
Heat and Cold	Temperature Projections (Chronic) (Reference period 1976-2005; Future period: 2041-2070)	Mid-century mean annual temperatures are projected to increase by 0.6–1.7°C and 1.1–1.9°C for the RCP4.5 and RCP8.5 scenarios, respectively. Temperature projections show a clear west-to-east gradient, with the largest increases in the east.	Mean annual temperature change: +1.3ºC Greatest seasonal change in Autumn with an expected increase of +1.6ºC	Mean annual temperature change: +1.7ºC Greatest seasonal change in Autumn with an expected increase of +2ºC
	Surface Humidity (Chronic) (Reference Period 1981-2000; Future period: 2041-2060)	Specific humidity[24] is projected to increase substantially (≈10%) for all seasons by the middle of the century. Relative humidity [25] is projected to increase slightly (or show ≈0% change) for all seasons except summer. For summer, relative humidity is expected to decrease in the south-east and increase in the north-west (both RCP scenarios).	Annual mean change in specific humidity: +8.5% Relative humidity is projected to increase slightly or show ≈0% change.	Annual mean change in specific humidity: 10.5% to 11.5% Relative humidity is projected to increase slightly or show ≈0% change.
	Heatwave[26] (Acute) (Reference period 1976-2005; Future period: 2041-2070)	The large projected increase in high summer temperatures suggests an increase in the number of heatwave events by the middle of the century. The changes range from -0.05 to 0.21 for the RCP4.5 scenario and from 0.04 to 0.28 for the RCP8.5 scenario. A sustained increase in the daily maximum temperature is associated with heatwaves.	Change in daily max temperature: +1.2ºC Increase in the number of heatwave events: 0.2 to 0.4	Change in daily max temperature: +1.7ºC Increase in the number of heatwave events: 0.3 to 0.5

[22] Climate Ireland - Climate Change Projection Maps. Where a range is given, results are provided for the 10th-90th percentile range of ensemble.
[23] Simulations were run for the reference period 1976-2005 and 1980-2000, and the future periods 2041–2060 and 2041-2070.
[24] Specific humidity is the amount of water vapour in the atmosphere calculated as the ratio of the mass of water vapour to the total mass of the air parcel.
[25] Relative humidity is the ratio of the amount of water vapour present in the air to the greatest amount possible at the same temperature.

IPCC Climate Impact Driver Category	Climate-related Hazard	Summary of Projections for Ireland[22]	Climate Model Simulations for Dublin[23] (RCP4.5 Scenario)	Climate Model Simulations for Dublin[23] (RCP8.5 Scenario)
	Frost and Ice days (Acute) (Reference period 1976-2005; Future period: 2041-2070)	The large projected decrease in cold nights implies a decrease in the number of frost and ice days by the middle of the century. The number of frost days (days when the minimum temperature is <0°C) is projected to decrease by 22.09 to 8.84 under the RCP 4.5 scenario and 27.75 to 15.50 under the RCP 8.5 scenario. The number of ice days (days when the maximum temperature is <0°C) is projected to decrease by 0.36 to 0.10 in the RCP 4.5 scenario and 0.36 to 0.20 in the RCP 8.5 scenario.	The number of frost days is projected to decrease by 5 to 20. The number of ice days is projected to decrease by 0.1 to 3.0.	The number of frost days is projected to decrease by 10 to 25. The number of ice days is projected to decrease by 0.2 to 5.0.
Wet and Dry	Precipitation (Chronic) (Reference period 1976-2005; Future period: 2041-2070)	Substantial decreases in precipitation are projected for the summer months, with reductions up to -8.68% for the majority of the country (90th percentile) for the RCP 4.5 scenario and -15.62% for the RCP 8.5 scenario. Dublin, however, indicates a change of +1% to +5% and -1% to +2% in the RCP 4.5 and RCP 8.5 scenarios, respectively. Other seasons, and over the full year, show small projected changes in precipitation with an average 2.86% and 4.81% increase over the whole country in the RCP4.5 and RCP8.5 scenarios, respectively. However, the mid-century precipitation climate is expected to become more variable with substantial projected increases in both dry periods and heavy precipitation events. The uncertainty of the mean precipitation projections may be partly attributed to the projected increase in the variability of the future Irish precipitation climate, resulting in an increase in both dry periods and heavy rainfall events.	Percentage increase in annual mean rainfall: 0.5-4% Percentage increase in summer rainfall: 1% to 5% Percentage increase in winter rainfall: 1% to 6%	Percentage increase in annual mean rainfall: 1-8% Percentage change in summer rainfall: -1% to +2% Percentage Increase in winter rainfall: 5% to 15%

IPCC Climate Impact Driver Category	Climate-related Hazard	Summary of Projections for Ireland[22]	Climate Model Simulations for Dublin[23] (RCP4.5 Scenario)	Climate Model Simulations for Dublin[23] (RCP8.5 Scenario)
	Heavy Precipitation Events (Acute) (Reference period 1976-2005; Future period: 2041-2070)	Changes in the occurrence of heavy rainfall events are of particular importance because of the link with flooding. The projections indicate a decrease in the annual number of wet days[27] for the RCP4.5 (mean value -2.42%) and RCP8.5 (mean value -2.61%) scenarios. There is a projected increase in the annual number of very wet days[28], with mean values of 0.54% and 0.74% for the RCP4.5 and RCP8.5 scenarios, respectively.	Projected decrease in the annual number of wet days: -1% to -3.5% *(It is noted that regional details may not be reliable because of a large variability in the ensembles).*	Projected change in the annual number of wet days: -3.5% to 0% *(It is noted that regional details may not be reliable because of a large variability in the ensembles).*
			Projected increase in the annual number of very wet days: 0.5% to 1.5% *(It is noted that regional details may not be reliable because of a large variability in the ensembles).*	Projected increase in the annual number of very wet days: 1% to 3% *(It is noted that regional details may not be reliable because of a large variability in the ensembles).*
	Dry Periods (Acute) (Reference Period 1981-2000; Future period: 2041-2060)	To quantify the potential impact of climate change on future drought events, the change in the number of dry periods[29] was analysed. The projections indicate an increase in the annual number of dry periods for the RCP4.5 and RCP8.5 scenarios (mean value ≈16% for both RCPs). The projected increases in dry periods are largest for summer, with "likely" values of +11% and +48% for the RCP4.5 and RCP8.5 scenarios, respectively.	Percentage increase in the number of annual dry periods: 28% Percentage increase in the number of summer dry periods: 30%	Percentage increase in the number of annual dry periods: 28% Percentage increase in the number of annual dry periods: 35%
Wind	Wind Speed and Sea Level Pressure (Chronic)	Mid-century mean 10-m wind speeds are projected to decrease for all seasons. The decreases are largest for summer months under the RCP8.5 scenario. The summer reductions in 10-m wind speed range from 0.3% to 3.4%	Percentage change in annual mean 10-m wind speed: -2% Change in annual average mean sea level pressure: 1.35 hPa	Percentage change in annual mean 10-m wind speed: -2.5% Change in annual average mean sea level pressure: 1.1 hPa

[27] A "wet day" is defined as one on which the daily precipitation amount is greater than 20mm.

[28] A "very wet day" is defined as one on which the daily precipitation is greater than 30mm.

[29] A dry period is defined as at least 5 consecutive days on which the daily precipitation is less than 1mm.

IPCC Climate Impact Driver Category	Climate-related Hazard	Summary of Projections for Ireland[22]	Climate Model Simulations for Dublin[23] (RCP4.5 Scenario)	Climate Model Simulations for Dublin[23] (RCP8.5 Scenario)
	(Reference Period 1981-2000; Future period: 2041-2060)	for the RCP4.5 scenario and from 2% to 5.4% for the RCP8.5 scenario. Annual average mean sea level pressure (MSLP) is projected to increase by the middle of the century for both the RCP4.5 (mean value 1.4hPa) and RCP8.5 scenarios (mean value 1.2hPa). There exists a clear south-east to north-west gradient in the projections, with the largest increases in the north. The projected increases in MSLP are some of many possible factors that could contribute to the projections of decreases in wind speed and wind power and increases in dry periods and heatwave events.		
	Storm Track Projections[30] (Acute) (Reference Period 1981-2000; Future period: 2041-2060)	Projections show a reduction of ≈10% in the numbers of less intense storms affecting Ireland and suggest an eastward extension of the more severe windstorms over Ireland and the UK from the middle of the century. It should be noted that because extreme storms are rare events, the storm projections should be considered with a level of caution.		
Snow and Ice	Snowfall (Chronic) (Reference Period 1981-2000; Future period: 2041-2060)	Annual snowfall is projected to decrease substantially by the middle of the century for the RCP4.5 (mean value 52%) and RCP8.5 scenarios (mean value 63%). The largest decreases are noted over low-lying regions. Averaged over the whole country, the "likely" decreases in mid-century snowfall are 51% and 60% for the RCP4.5 and RCP8.5 scenarios, respectively.	Percentage decrease in mean annual in snowfall: -67%	Percentage decrease in mean annual in snowfall: -75%

[30] Given the large societal impacts of extreme storms, there is considerable interest in the potential impact of climate change on extreme cyclonic activity in the North Atlantic. Windstorms and associated high wind speeds are a major source of natural hazard risk for Ireland and many countries across Europe.

IPCC Climate Impact Driver Category	Climate-related Hazard	Summary of Projections for Ireland[22]	Climate Model Simulations for Dublin[23] (RCP4.5 Scenario)	Climate Model Simulations for Dublin[23] (RCP8.5 Scenario)
Other (Energy Impacts)	Heating degree days[31] (Reference period 1976-2005; Future period: 2041-2070)	The projected change in heating degree days (HDDs) shows that by the middle of the century there will be a greatly reduced requirement for heating in Ireland, with HDDs projected to decrease by 8-23% and 15–25% for the RCP4.5 and RCP8.5 scenarios, respectively. Averaged over the whole country, the expected decreases in HDDs are 15% and 20% for the RCP4.5 and RCP8.5 scenarios, respectively.	Percentage decrease in mean annual HDD: 15-23%	Percentage decrease in mean annual HDD: 11-20%
	Cooling degree days[32] (Reference Period 1981-2000; Future period: 2041-2060)	The projections show that cooling degree days (CDDs) are expected to slightly increase, particularly over the east and midlands, suggesting a small increase in air conditioning requirements by the middle of the century. However, the amounts are small compared with HDDs and therefore have a negligible effect on the projected changes in the total energy demand.		
	Solar photovoltaic (PV) power (Reference Period 1981-2000; Future period: 2041-2060)	To assess the impacts of climate change on solar power in Ireland, projections of solar photovoltaic (PV) power were analysed. Results show an expected small decrease in PV by the middle of the century ranging from ≈0 to 4% (mean -1.04%) in the RCP 4.5 scenario. The largest decreases are noted in the north of the country. The mean change in the RCP 8.5 scenario is -2.19%.	Percentage decrease in mean annual PV: -0.5% to -1.5%	Percentage decrease in mean annual PV: -0.5% to -3%

[31] A degree day, an estimate of accumulated heat, is defined as the deviation (°C) from a base temperature value. Heating degree days (HDDs) are used by power companies and consumers to estimate the amount of energy required for residential or commercial space heating during the cold season.

[32] Cooling degree days (CDDs) are used to estimate the amount of air conditioning usage during the warm season.

3 CLIMATE RISK SCREENING

3.1 Technical Screening Criteria Requirements

For the purposes of the assessment, the methodology outlined in Regulation (EU) 2020/852 of the European Parliament and of the Council (the 'Taxonomy Regulation') and Commission Delegated Regulation (EU) 2021/2139[33] (the 'Supplementing Regulation') for a Climate Risk and Vulnerability Assessment has been adopted.

The 'Supplementing Regulation' establishes the Technical Screening Criteria for '*Substantial contribution to climate change adaptation'* specific to certain economic activities. Annex II, Section 7.1 (2) of the Supplementing Regulation sets out the following criteria for assessing risk on the 'Construction of new buildings':

2. *The physical climate risks that are material to the activity have been identified from those listed in Appendix A to this Annex by performing a robust climate risk and vulnerability assessment with the following steps:*

    a. *screening of the activity to identify which physical climate risks from the list in Appendix A to this Annex may affect the performance of the economic activity during its expected lifetime;*

    b. *where the activity is assessed to be at risk from one or more of the physical climate risks listed in Appendix A to this Annex, a climate risk and vulnerability assessment to assess the materiality of the physical climate risks on the economic activity;*

    c. *an assessment of adaptation solutions that can reduce the identified physical climate risk.*

The first step of the climate risk and vulnerability assessment, as set out in Annex II, Section 7.1 (2) (a) of the Supplementing Regulation (and provided above), is the screening of the activity to identify which physical climate risks from the list in Appendix A of Annex II of the Supplementing Regulation may affect the performance of the economic activity during its expected lifetime. These physical climate risks are provided in Table 3-1.

Table 3-1: Classification of climate related hazards (Source: Appendix A of Annex II of the Commission Delegated Regulation 2021/2139[34])

	Temperature-related	Wind-related	Water-related	Solid mass-related
Chronic	Changing temperature (air, freshwater, marine water)	Changing wind patterns	Changing precipitation patterns and types (rain, hail, snow/ice)	Coastal erosion

[33] Commission Delegated Regulation (EU) of 4.6.2021 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives.

[34] Appendix 2 of this report contains a copy of Appendix A of Annex II of the Supplementing Regulation.

	Temperature-related	Wind-related	Water-related	Solid mass-related
	Heat stress		Precipitation or hydrologi-cal variability	Soil degradation
	Temperature variability		Ocean acidification	Soil erosion
	Permafrost thawing		Saline intrusion	Solifluction
			Sea level rise	
			Water stress	
Acute	Heat wave	Cyclone, hurricane, typhoon	Drought	Avalanche
	Cold wave/frost	Storm (including blizzards, dust and sandstorms)	Heavy precipitation (rain, hail, snow/ice)	Landslide
	Wildfire	Tornado	Flood (coastal, fluvial, pluvial, ground water)	Subsidence
			Glacial lake outburst	

The climate risk screening primarily considers the location of the Proposed Development; this allows certain climate-related hazards to be initially excluded from the screening assessment based on location. Climate projections for the area of the Proposed Development along with risk levels as determined by the IPCC AR6 WGI and DLRCC CCAP are then utilised to determine the climate risks which are material to the Proposed Development. Climate risks that are material to the Proposed Development are then subsequently identified from those listed in Table 3-1.

3.2 Risk Identification

3.2.1 Project Site Location

The subject site is ca 14.2 Ha. on predominantly greenfield lands at Wayside, Enniskerry Road and Glenamuck Road, Kilternan, Dublin 18. The site is located approximately 1.9km southwest of the M50 and the Carrickmines Retail Park. The proposed development site location is presented in **Appendix 1**.

The site is divided into two parcels of land which will be separated by the future Glenamuck Distributer Link Road (GLDR). The western portion site is generally bounded by the Glenamuck Road to the north; the Sancta Maria property to the north, west and south; a recently constructed residential development named "Rockville" to the north-east; the Enniskerry Road to the south-west; dwellings to the south; and the future GLDR to the east. The eastern site is generally bound by dwellings to the south; the future GLDR to the west; and greenfield land to the north and east.

According to the Hydrological Risk Assessment[35], the soils beneath the majority of the site are mapped by Teagasc (Teagasc, 2024) as deep well drained mineral (mainly acidic), Acid Brown Earths, Brown Podzolics (IFS Soil Code: AminDW) derived from mainly non-calcareous parent materials described as till derived chiefly from granite (TGr). While the soils beneath the northwest and southern portions of the site are mapped by Teagasc (Teagasc, 2024) as made ground (IFS Soil Code: Made).

The subsoil or quaternary sediments beneath the majority of the site are mapped by the GSI (GSI, 2024) as till derived from granites (TGr). While the subsoil or quaternary sediments beneath the northern portion of the Site and along a small section of the southern site boundary are mapped by the GSI (GSI, 2024) as bedrock outcrop or subcrop.

The bedrock beneath the Site is mapped by the GSI (GSI, 2024) as Type 3 Muscovite Porphyritic (New Code: IDNLGR3) described as granites with muscovite phenocrysts. While no bedrock outcrops are mapped within the site boundary, a cluster of bedrock outcrops is located approximately 0.04 km off the southeast corner of the site (GSI, 2024).

As documented in the Engineering Infrastructure Report[36], the topography at the Site is generally a gradually increased slope downwards from the Enniskerry Road along the western boundary in an easterly and north-easterly direction and falling off sharply towards the eastern boundary at a gradient of approximately 10%. Ground elevations at the site range from approximately 141.5 meters above Ordnance Datum (mOD) in the southwest to 122.5mOD in the northeast.

The subsoil and bedrock of the area are not prone to subsidence and the topography of the site and surrounding area would not be prone to landslide risk.

Flood zones are defined in the *"Planning System and Flood Risk Management"* Guidelines as *"geographical areas within which the likelihood of flooding is within a particular range".* In accordance with the Guidelines, flood maps were produced as part of DLRCC's Strategic Flood Risk Assessment (SFRA)[37] which accompanied the 2022 – 2028 County Development Plan. From these flood maps, it is evident that the Site of the Proposed Development is located in Flood Zone C, which indicates that the *"probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding)".*

A Site-Specific Flood Risk Assessment[38] (FRA) has been carried out for the Proposed Development which considers the potential flood mechanisms at the Site, these are as follows:

- Fluvial flooding from nearby watercourses;
- Pluvial flooding from insufficient capacity of the local urban drainage network;
- Groundwater flooding;
- Tidal flooding;

[35] Hydrological Risk Assessment, Enviroguide, July 2024.
[36] Engineering Infrastructure Report and Storm Water Impact Assessment, Roger Mullarkey & Associates, June 2024.
[37] Strategic Flood Risk Assessment (SFRA) prepared as part of the Dun Laoghaire Rathdown County Development Plan 2022-2028
[38] Refer to Flood Risk Assessment, Roger Mullarkey & Associates, May 2024.

- Human/Mechanical Error caused by blockages in piped systems or intervention of/failure of mechanical devices.

As there are no known watercourses either on or upstream of the subject lands, and the roadside drainage channel along the Glenamuck Road is several meters below the subject lands, there is a low risk fluvial of flooding onto the site.

According to the FRA, there is a low risk of groundwater flooding and tidal flooding onsite. Reference to land mapping websites such as google maps/OSI mapviewer indicate that the site is more than 5.5km from the coast where the highest tide level is ca. 4m. The site topographical survey demonstrates that the land is elevated at c.142mOD Malin Head.

According to the FRA, the risk of pluvial flooding from the new infrastructure planned is not deemed as a low-risk occurrence and the vulnerability of residential development is deemed as high. Due to the predicted increase in the frequency and intensity of extreme rainfall events it is prudent that Site specific drainage and management measures aimed at mitigating the effects of pluvial flooding are incorporated into the development design. These measures are discussed in Table 4-1 of this Report.

There are flood risks associated with misuse, neglect, damage, intervention of or lack of intervention attributable to mechanical failure or human error. Such a risk can be caused by blockages in piped systems or lack of maintenance of mechanical devices. As there is some risk of pluvial flooding from human/mechanical error, the new infrastructure is not deemed as a low-risk occurrence and the vulnerability of residential development is deemed as high[39]. Measures to alleviate any risk of pluvial flooding from human/mechanical error at the Site will be required and are discussed in Table 4-1 of this Report.

Based on a review of the Proposed Development Site location, the following potential climate-related hazards, as listed in Table 3-1, can be excluded from the screening assessment:

- **Sea level rise:**

  - Due to the elevation of the Site and its position above sea level, it is not expected to be affected by sea level rise.[40]

- **Temperature-related:** permafrost thawing; wildfire.

  - The Site is located close to an urban setting; therefore, highly unlikely to be affected by wildfires. Permafrost is not relevant to the Irish climate.

- **Wind-related:** tornado.

  - It is possible that thunderstorms with conditions favourable for tornado events and warmer, unstable weather attributed to climate change may be linked. On average,

[39] Refer to Flood Risk Assessment, Roger Mullarkey & Associates, May 2024 and Engineering Infrastructure & Stormwater Impact Assessment Report, Roger Mullarkey & Associates, June 2024.
[40] Climate Central - Coastal Risk Screening Tool

Ireland experiences ten tornadoes per year although many of these are weak and often occur without being noticed. There have been more reports of tornadoes in Ireland in recent years, some of which have caused considerable damage to buildings and local infrastructure. This may indicate that the risk of more powerful tornadoes in Ireland is rising, however there currently lacks tangible evidence on this subject. Therefore, it is recommended that this climate hazard is revisited in line with emerging studies and findings.

- **Solid mass-related:** soil degradation; soil erosion; solifluction; avalanche; landslide; subsidence**.**

- In relation to soil degradation and soil erosion, there will be unavoidable loss of in—situ soil and subsoil from the Proposed Development Site to achieve the required formation levels for the Proposed Development including building foundations, roads, drainage, and other infrastructure. It is anticipated that all excavated soil will be reused on Site, subject to suitability testing.

- Due to the use of appropriate foundations, as recommended within the Ground Investigation Report[41], the Site will not be prone to subsidence.

- Due to the location and topography of the Site, solifluction has been excluded in the long-term.

- According to the Landslide Susceptibility Map developed by Geological Survey Ireland (GSI), the Proposed Development Site is Low in terms of landslide susceptibility.[42]

- Avalanches are not considered relevant based on Irelands historical and future projected climate.

3.2.2 IPCC AR6 WGI Climate Impact Drivers and Confidence in Future Changes for Northern Europe and Ireland

The IPCC WGI has developed an Interactive Atlas to demonstrate Climatic impact-drivers (CIDs) predictions across the globe. CIDs are physical climate system conditions (e.g., means, events, extremes) that affect an element of society or ecosystems. Depending on system tolerance, CIDs and their changes can be detrimental, beneficial, neutral, or a mixture of each across interacting system elements and regions. CID types include heat and cold, wet and dry, wind, snow and ice, coastal and open ocean.

Chapter 12 of IPCC AR6 WGI surveys the links between CIDs and affected sectors and provides a matrix of CIDs for regional sectors that are rated based on their potential impact and risk relevance. Impacts, risks, and opportunities are rarely attributable to a single CID index or threshold, but climate shifts that push conditions outside of expected conditions and beyond tolerance levels are indicative of impact, risk or benefit given vulnerability and exposure. Focus is on direct sectoral connections of a CID rather than cascading or secondary

[41] Refer to Ground Investigation Report, Ground Investigations Ireland, May 2024.

[42] Geological Survey Ireland - Landslide Susceptibility Map

effects. Within each sector there is a multitude of specific sectoral systems that may be affected by CID increases and decreases, with consequences further distinguished by region, background climate and socio-economic or ecological context of the affected asset.

The Proposed Development falls within the sector of the “Built Environment” as per IPCC AR6 WGI. Therefore, CIDs and their associated impact/risk relevance for the Built Environment have been provided in Table 3-2:

Table 3-2: Impacts and Risk Relevance for the "Built Environment”.

Category	CIDs	Impacts and Risk Relevance
HEAT AND COLD	Mean air temperature	High
	Extreme heat	High
	Cold spell	Low/moderate
	Frost	None/low confidence
WET AND DRY	Mean precipitation	None/low confidence
	River flood	High
	Heavy precipitation and pluvial flood	High
	Landslide	Low/moderate
	Aridity	None/low confidence
	Hydrological drought	None/low confidence
	Agricultural and ecological drought	Low/moderate
	Fire weather	Low/moderate
WIND	Mean wind speed	None/low confidence
	Severe windstorm	High
	Tropical cyclone	High
	Sand and dust storm	Low/moderate
SNOW AND ICE	Snow, glacier and ice sheet	None/low confidence
	Permafrost	Low/moderate
	Lake, river and sea ice	None/low confidence
	Heavy snowfall and ice storm	Low/moderate
	Hail	Low/moderate
	Snow avalanche	Low/moderate
COASTAL AND OCEANIC	Relative sea level	High
	Coastal flood	High
	Coastal erosion	High
	Marine heatwave	None/low confidence
	Ocean acidity	None/low confidence
OTHER	Air pollution weather	None/low confidence
	Atmospheric CO_2 at surface	None/low confidence
	Radiation at surface	Low/moderate

The CIDs, and confidence in future changes of climate for Northern Europe are demonstrated in Table 3-3:

Table 3-3: IPCC WGI Interactive Atlas: Regional synthesis Climate Change Predictions for Northern Europe

Category	CIDs	Future Changes	
HEAT AND COLD	Mean surface temperature	High confidence of increase	△
	Extreme heat	High confidence of increase	△
	Cold spell	High confidence of decrease	▽

Category	CIDs	Future Changes	
	Frost	High confidence of decrease	▽
WET AND DRY	Mean precipitation	High confidence of increase	△
	River flood	Medium confidence of decrease	▽
	Heavy precipitation and pluvial flood	High confidence of increase	△
	Landslide	Low confidence in direction of change	—
	Aridity	High confidence of decrease	▽
	Hydrological drought	Low confidence in direction of change	—
	Agricultural and ecological drought	Low confidence in direction of change	—
	Fire weather	Low confidence in direction of change	—
WIND	Mean wind speed	Medium confidence of decrease	▽
	Severe windstorm	Medium confidence of increase	△
	Tropical cyclone	Not relevant	⊠
	Sand and dust storm	Not relevant	⊠
SNOW AND ICE	Snow, glacier and ice sheet	High confidence of decrease	▽
	Permafrost	High confidence of decrease	▽
	Lake, river and sea ice	High confidence of decrease	▽
	Heavy snowfall and ice storm	Low confidence in direction of change	—
	Hail	Low confidence in direction of change	—
	Snow avalanche	Low confidence in direction of change	—
COASTAL AND OCEANIC	Relative sea level	High confidence of increase	△
	Coastal flood	High confidence of increase	△
	Coastal erosion	High confidence of increase	△
	Marine heatwave	High confidence of increase	△
	Ocean acidity	High confidence of increase	△
OTHER	Air pollution weather	Low confidence in direction of change	—
	Atmospheric CO_2 at surface	High confidence of increase	△
	Radiation at surface	Medium confidence of decrease	▽

The CIDs and predicted changes in future climate for Dublin, Ireland are presented in Table 3-4 below, as adapted from the findings in Table 2-2 of this Report:

*Table 3-4: Climate Change Predictions for **Dublin** (based on Climate Ireland Climate Change Projection Maps)*

Category	CIDs	Future Changes
HEAT AND COLD	Mean surface temperature	Predicted increase
	Extreme heat	Predicted increase
	Cold spell	Predicted decrease
	Frost	Predicted decrease
WET AND DRY	Mean precipitation	Predicted increase
	River flood	Predicted increase
	Heavy precipitation and pluvial flood	Predicted increase
	Hydrological drought	Predicted increase

Category	CIDs	Future Changes
	Agricultural and ecological drought	Predicted increase
WIND	Mean wind speed	Predicted decrease
	Severe windstorm	Predicted increase
SNOW AND ICE	Snow, glacier and ice sheet	Predicted decrease
	Heavy snowfall and ice storm	Predicted decrease
COASTAL AND OCEANIC	Relative sea level	Predicted increase
ENERGY IMPACTS (OTHER)	Heating degree days	Predicted decrease
	Cooling degree days	Predicted increase
	Solar photovoltaic (PV) power	Predicted decrease

3.2.3 DLRCC Climate Action Plan (2024-2029) Risk Statement

According to the Dun Laoghaire-Rathdown Climate Action Plan (2024-2029) (DLR CAP), the potential impacts of future risks from climate change will be increased by the socio-economic and demographic growth that the County is expected to undergo in the future. The increasing risk from climate change will have an impact on the County in terms of people and communities affected including damage and disruption to assets and the economy.

Projected changes in levels of hazard, exposure, and vulnerability, combine to form an assessment of future climate risks for DLR. The risk matrix in Figure 3-1 shows the future change in risk with the hollow dot showing the current risk and the solid dot the future risk. The dashed line shows the change between the current and future risk.

As illustrated in the climate risk matrix (Figure 3-1), projections indicate that the level of risk associated with some hazards (e.g. coastal erosion, coastal, river and pluvial flooding, heatwaves and droughts) will increase while the level of risk will remain the same for others (e.g. severe windstorms and groundwater). Risks associated with some hazards are expected to decrease due to projected reductions in hazard frequency such as cold spells and heavy snowfalls.

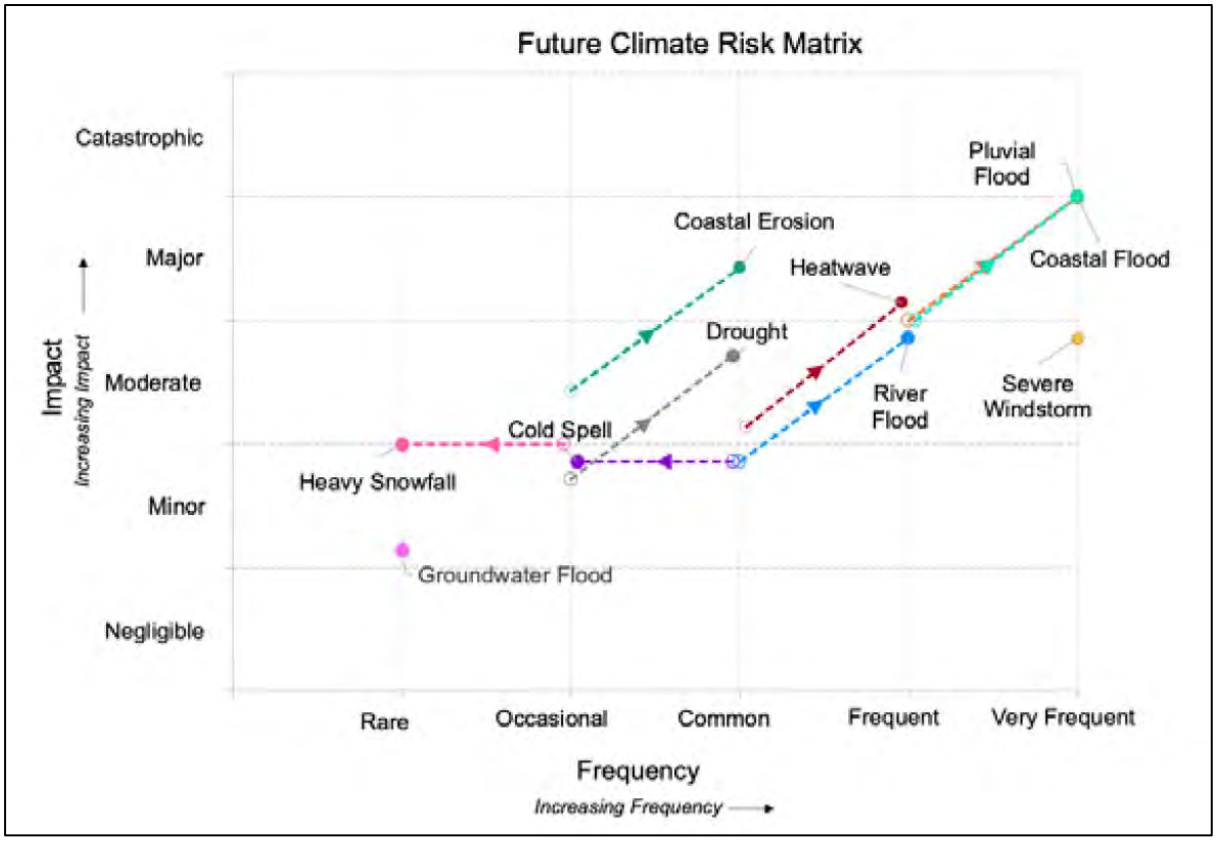

Figure 3-1: Risk matrix showing the future changes in risk for the identified hazards within Dun Laoghaire-Rathdown County (Source: DLR CAP)

The following Table 3-5 has been adapted from the DLRCC Climate Change Adaptation Strategy (DLR CCAS) and identifies future climate hazards and their relevant impact areas.

Table 3-5: Climate Risk Identification (Adapted from DLR CAP)

Climatic Hazard	Future changes in risk	Climate Projection	Risk Statement
Coastal flooding	Projected increase	Projections of sea level under a high emissions scenario indicate an increase of up to 0.24m by 2050 which will increase the frequency of coastal flooding in the county. Rising sea level is strongly linked with increases and extents of coastal erosion.	**Coastal flooding** already poses a significant risk for our County. This has resulted in the temporary flooding of assets, transport disruption and detrimental impacts on protected species and habitats. Rising sea levels will increase the frequency and extent of coastal flooding across the County. Risk associated with coastal erosion is also projected to increase as a result of sea level rise.

Climatic Hazard	Future changes in risk	Climate Projection	Risk Statement
Severe windstorms	No significant change	Projections of storms are subject to a high level of uncertainty. By mid-century, projections indicate that average wind speed will remain similar to those currently experienced. There is limited evidence of a potential increase in the frequency of more intense storms which are currently rare events.	**Severe windstorms** are currently experienced on a very frequent basis across the County and result in wide-ranging impacts, including damage to power and communication infrastructure, disruption to transport networks and postponement of recreational activities. Projections indicate no significant change to this frequency.
River and pluvial flooding	Projected increase	Projections indicate an increase in the frequency of heavy rainfall days (days with precipitation greater than 30mm) for DLR, with some area projected to see an increase of up to 12.4%. This will likely result in an increased frequency of associated river and pluvial flooding.	Recent experiences of annual **river and pluvial flooding** events between 2018-2022, resulted in damages to buildings, amenities and recreational areas, closure of businesses and disruption of transport networks. Projected increases in the frequency of extreme precipitation events will result in increased surface water and riverine flood risk for the County.
Heatwave and drought	Projected increase	Projections indicate an overall increase in average temperature of between 1.2 and 1.6ºC for DLR relative to the 1981-2000 period. Under a high emission scenario, projections indicate that heatwaves will become more frequent by mid-century. Summer rainfall is expected to reduce in the future when compared with the baseline period of 1981-2000, contributing to potential drought conditions.	The County experienced both a **heatwave** and **drought** in 2018, while a **heatwave** was also recorded in 2022. These events resulted in damage to road surfaces, disruption of public transport networks, increased frequency of uncontrolled fires and increased demand on water resources (resulting in hosepipe bans). Projected increases in the frequency of heatwaves and drought conditions will mean that events currently experienced on an infrequent basis will become more frequent.
Cold spells and heavy snowfall	Projected decrease	As a consequence of the increasing temperatures, a decrease in the number of frost days and ice days in the 2041-2060 future period is projected when compared with the baseline period of 1981-2000. The annual snowfall in the region is projected to decrease substantially by the middle of the century.	Experiences of **cold spells and heavy snowfall** events in 2018 (e.g. Storm Emma) demonstrated the wide range of impacts for the County. These included, amongst others, road closures, disruption to public transport, power outages and impacts on water r sources (restricted water supply during storm Emma). Projected increases in average temperature and decreases in the frequency of snowfall indicate a decrease in the frequency of cold spells, heavy snowfall, and their associated impacts.

Climatic Hazard	Future changes in risk	Climate Projection	Risk Statement
Groundwater flooding	No significant change	Projections of changes in groundwater flooding are currently not available, therefore there is uncertainty in the change in groundwater flooding frequency that can be expected.	**Groundwater flooding** is currently experienced rarely in the County with limited impacts such as damage to roads and transport disruption.

3.2.4 Identified Climate Risks

The CIDs, and confidence in future changes of climate for Northern Europe, as presented in IPCC AR6 WGI, have been taken into consideration along with the location of the Proposed Development, projected changes in climate for Ireland, and future climate risk levels as determined within the DLR CCAP, in order to determine what risks are material to the Proposed Development.

Based on these findings, as presented in Table 3-2 to Table 3-5, the following Table 3-6 indicates the CIDs of relevance to the Proposed Development. Only CIDs which have been assigned as low/moderate or high in IPCC AR6 WGI findings for the “Built Environment” have been included here; anything that has been assigned none/low confidence has been omitted (aside from hydrological drought).

Table 3-6: Climate Risk Screening

Category	CIDs	IPCC Impacts and Risk Relevance to the Built Environment	Predicted Change in CID for Northern Europe and Ireland (Dublin)	Included in DLR CAP	Material Risk
HEAT AND COLD	Mean air temperature (chronic)	High	High confidence of increase in Northern Europe. Projections for Dublin indicate an increase in mean air temperature.	Yes	**Yes**
	Extreme heat (acute)	High	High confidence of increase in Northern Europe. Projections for Dublin indicate an increase in heatwaves.	Yes	**Yes**
	Cold spell (acute)	Low/moderate	High confidence of decrease in Northern Europe. Projections for Dublin indicate a decrease in cold spells.	Yes	**No**
WET AND DRY	River flood (acute)	High	Medium confidence of decrease for Northern Europe. Very wet days predicted to increase in Dublin.	Yes	**Yes**
	Heavy precipitation and pluvial flood (acute)	High	High confidence of increase for Northern Europe. Very wet days predicted to increase in Dublin.	Yes	**Yes**
	Landslide (acute)	Low/moderate	Low confidence in direction of change. the Proposed Development Site ranges from Low to Moderately Low in terms of landslide susceptibility.	No	**No**
	Hydrological Drought[43] (acute)	None/low confidence	Low confidence in direction of change for Northern Europe. Number of dry periods expected to increase in Dublin.	Yes	**Yes**

[43] Though this has been assigned as none/low confidence by the IPCC in terms of impacts and risk relevance to the built environment, climate predictions for Ireland indicate an increase in the frequency and duration of droughts. Therefore, this CID has not been omitted from the current risk screening.

Category	CIDs	IPCC Impacts and Risk Relevance to the Built Environment	Predicted Change in CID for Northern Europe and Ireland (Dublin)	Included in DLR CAP	Material Risk
	Agricultural and ecological drought (acute)	Low/moderate	Low confidence in direction of change.	No	**No**
	Fire weather (acute)	Low/moderate	Low confidence in direction of change.	No	**No**
WIND	Severe windstorm (acute)	High	Medium confidence of increase in Northern Europe. Increase in windstorms projected for Ireland with level of caution for uncertainty.	Yes	**Yes**
	Tropical cyclone (acute)	High	Not relevant for location.	No	**No**
	Sand and dust storm (acute)	Low/moderate	Not relevant for location.	No	**No**
SNOW AND ICE	Permafrost thawing (chronic)	Low/moderate	Not relevant for location.	No	**No**
	Heavy snowfall and ice storm (acute)	Low/moderate	Low confidence in direction of change for Northern Europe. Projections for Dublin predict a decrease in snowfall.	Yes	**No**
	Hail (acute)	Low/moderate	Low confidence in direction of change.	No	**No**
	Snow avalanche (acute)	Low/moderate	Not relevant for location.	No	**No**
COASTAL & OCEANIC	Relative sea level (chronic)	High	High confidence of increase in Northern Europe. A 6-7mm rise per year in Dublin Bay was recorded between the years 2000 and 2016.	Yes	**No**
	Coastal flood (acute)	High	High confidence of increase in Northern Europe. Due to the location of the site and proximity to the coast, the SSFRA does not consider coastal flooding to be a risk to the Proposed Development.	Yes	**No**

Category	CIDs	IPCC Impacts and Risk Relevance to the Built Environment	Predicted Change in CID for Northern Europe and Ireland (Dublin)	Included in DLR CAP	Material Risk
	Coastal erosion (chronic)	High	High confidence of increase in Northern Europe. Due to the location of the site and proximity to the coast, coastal erosion is not considered to be a risk to the Proposed Development.	Yes	**No**
OTHER	Radiation at surface (chronic)	Low/moderate	Medium confidence of decrease in Northern Europe. The Radon Map for Ireland indicates that the Application Site is located in an area where about 1 in 5 homes in this area are likely to have high radon levels.	No	**Yes**
	Compound flooding	High	The probability of these events is projected to increase along northern European coasts	No	**Yes**

Taking account of the findings presented in Table 3-2 to Table 3-6, the physical climate risks from the list in Appendix A of Annex II of the Supplementing Regulation (as provided in Table 3-1) which may affect the performance of the economic activity during its expected lifetime have been revised in terms of relevancy to the Proposed Development. Table 3-7 presents the physical climate risks which have been deemed relevant to the Proposed Development (highlighted) and those which have been excluded (strikethrough):

Table 3-7: Classification of climate related hazards which are relevant to the Proposed Development

	Temperature-related	Wind-related	Water-related	Solid mass-related
Chronic	Changing temperature (air, freshwater, marine water)	~~Changing wind patterns~~	~~Changing precipitation patterns and types (rain, hail, snow/ice)~~	~~Coastal erosion~~
	~~Heat stress~~		~~Precipitation or hydro-logical variability~~	~~Soil degradation~~
	~~Temperature variability~~		~~Ocean acidification~~	~~Soil erosion~~
	~~Permafrost thawing~~		~~Saline intrusion~~	~~Solifluction~~
			~~Sea level rise~~	
			~~Water stress~~	
Acute	Heat wave	~~Cyclone, hurricane, typhoon~~	Drought	~~Avalanche~~
	~~Cold wave/frost~~	Storm (including blizzards, dust and sandstorms)	Heavy precipitation (rain, hail, snow/ice)	~~Landslide~~
	~~Wildfire~~	~~Tornado~~	Flood (coastal, fluvial, pluvial, ground water)	~~Subsidence~~
			~~Glacial lake outburst~~	

4 CLIMATE RISK AND VULNERABILITY ASSESSMENT

4.1 Technical Screening Criteria Requirements

In accordance with the methodology as outlined in Annex II, Section 7.1 (2) (a) of the Supplementing Regulation, Section 3 of this Report has screened the activity to identify which physical climate risks from the list in Appendix A of Annex II of the Supplementing Regulation may affect the performance of the economic activity during its expected lifetime.

The remaining steps, as set out in Annex II, Section 7.1 (2) of the Supplementing Regulation (and provided above), are to conduct a climate risk and vulnerability assessment to assess the materiality of the physical climate risks on the economic activity and assess the adaptation solutions that can reduce the identified physical climate risk. This has been completed using the IPCC framework on the assessment of risk and is detailed in the following sections.

4.2 Climate Risk and Vulnerability Assessment Framework

The IPCC provides a framework to assess risk. This framework evaluates risks which may emerge due to the overlap of Climate Hazards, Vulnerability, and Exposure[44].

Figure 4-1: IPCC (AR6) Risk Assessment Propeller

[44] IPCC (2022) Working Group II Contribution to the Sixth Assessment Report (AR6), Climate Change 2022: Impacts, Adaptation and Vulnerability.

Section 3 (Climate Risk Screening) identified the following Climate Hazards as posing a potential risk to the Proposed Development:

- Temperature (chronic)
- Temperature (acute)
- Precipitation (acute)
- Drought (acute)
- Wind (acute)
- Compound events (acute)

Table 4-1 below evaluates these Climate Hazards, the risk factors (Exposure), the current sensitivity and adaptive capacity of the development (Vulnerability), and the subsequent risk level. Adaptation solutions that can reduce the identified physical climate risk have been assessed and any further recommendations for additional adaptation and mitigation measures which may improve the Proposed Development's resilience to climate change impacts are also noted.

Table 4-1: Risk and Vulnerability Assessment

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
WET AND DRY	**Temperature (chronic)** *Increase in mean annual air temperature*	Increased cooling days for the buildings, extra power usage.	Green roofs are proposed which will have a cooling effect and contribute to the reduction of urban heat island. They will also contribute to biodiversity. Landscaping and the use of trees and plants will shade and contribute to the cooling of the air through evapotranspiration[45]. A number of low energy technologies are being considered for the development; the specific combination from the options as listed within the Energy Statement will be decided upon during the detailed design stage and then implemented to achieve an A2/ A3 BER rating[46]. Mechanical heat recovery ventilation will be considered to provide ventilation with low energy usage.[47] Natural ventilation is being evaluated as a ventilation strategy to minimise energy usage. PV solar panels are being considered which will offset Primary Energy associated with electricity. The PV solar panels convert the electricity produced by the PV system (which is DC) into AC electricity. The panels are typically placed on the south facing side of the building for maximum heat gain and in some instances, can also be used to assist the heating system. The passive measures included in the design, such as minimising solar gain (glazing selection), high performance U-values, improved air tightness, and	Low Risk once existing proposed measures are implemented.	Inspection and maintenance of the PV solar panel and HVAC systems (if implemented) will be carried out periodically and completed in accordance with good practice. This will be the responsibility of individual property owners / The Management Company where appropriate.

[45] Evapotranspiration is a term used to refer to the combined processes by which water moves from the earth's surface into the atmosphere.
[46] Refer to Energy Statement, Waterman Moylan Consulting Engineers Limited, May 2024
[47] Refer to Energy Statement, Waterman Moylan Consulting Engineers Limited, May 2024.

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
			improved thermal transmittance and thermal bridging significantly contributes towards reducing the loads on the active systems within the building. The active measures have been designed to reduce the primary energy consumption through intelligent control and highly efficient plant and equipment.[48]		
	Temperature (acute) *Increase in frequency and duration of heatwave events*	Increased cooling days for buildings, extra power usage.	The design has allowed for the integration of an extensive green roof system[49] which will have a cooling effect and contribute to the reduction of urban heat island effect. A number of low energy technologies are being considered for the development; the specific combination from the options as listed within the Energy Statement will be decided upon during the detailed design stage and then implemented to achieve an A2 / A3 BER rating[50]. Centralised mechanical ventilation systems will be considered to provide ventilation with low energy usage. Natural ventilation is being evaluated as a ventilation strategy to minimise energy usage. PV solar panels are being considered which will offset Primary Energy associated with electricity. The PV solar panels convert the electricity produced by the PV system (which is DC) into AC electricity. The panels are typically placed on the south facing side of the building for maximum heat gain and in some instances, can also be used to assist the heating system.	Low Risk once existing proposed measures are implemented.	Inspection and maintenance of the PV solar panels and HVAC systems (if implemented) will be carried out periodically and completed in accordance with good practice. This will be the responsibility of individual property owners/ The Management Company where appropriate.

[48] Refer to Energy Statement, Waterman Moylan Consulting Engineers Limited, May 2024.
[49] Refer to Engineering Infrastructure Report and Stormwater Impact Assessment, Roger Mullarkey & Associates, June 2024.
[50] Refer to Energy Statement, Waterman Moylan Consulting Engineers Limited, May 2024.

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
	Precipitation (acute) *Increase in heavy precipitation and pluvial & river flood*	Pressure on drainage systems.	According to the Flood Risk Assessment[51], the Site is classed as having a low risk of flooding on Site and categorised as a Flood Zone C[52]. The land for the proposed housing area is predominately flat. The general topography outside the application site and the surrounding lands is downwards towards the Glenamuck Road and the adjacent roadside ditch. As there are no known watercourses either on or upstream of the subject lands, and the roadside drainage channel along the Glenamuck Road is several metres below the subject lands, there is a low risk of fluvial flooding onto the site.[53]. Pluvial flooding at the site resulting from the construction of the Proposed Development has not been deemed as a low-risk occurrence, and the vulnerability of residential development to pluvial flooding is high. Therefore, the following measures are proposed to alleviate any risk of pluvial flooding at the Site[54]: • The proposed new drainage surface water infrastructure for the development has been designed to cater for flows generated by all storms up to the Q100+20%(climate change) without flooding occurring. The drainage design has also allowed for more than the min.10% Urban Creep allowance as required in the DLRCC Stormwater Management Policy document;	Low Risk once existing proposed measures are implemented.	Inspection and maintenance of the drainage systems is carried out periodically and completed in accordance with good practice. The inspection and maintenance of public drains will be the responsibility of DLRCC, and the inspection and maintenance of private drains that serve the communal units will be the responsibility of the Management Company.

[51] Refer to Flood Risk Assessment, Roger Mullarkey & Associates, May 2024.
[52] Probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding).
[53] Refer to Flood Risk Assessment, Roger Mullarkey & Associates, May 2024.
[54] Refer to Flood Risk Assessment, Roger Mullarkey & Associates, May 2024 and Engineering Infrastructure & Stormwater Impact Assessment Report, Roger Mullarkey & Associates, June 2024.

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
			• The pipe sizes and gradients are designed to convey the storm water flows to a singular attenuation location where the storage capacity has been designed to exceed the Q100+20% event. Calculations for the critical rainfall events have been included in the appendix of the Engineering Infrastructure & Stormwater Impact Assessment report; • The calculated Q30+20% Climate Change storm water storage volume for total site is c.5,371m^3 as determined from the MicroDrainage simulation modelling software and is spread across 4No.catchments in the 10No. voided arch MC4500 & MC3500 systems; • The calculated volume for the Q100 +20% Climate Change event is c.6,876m3 as determined from the MicroDrainage simulation modelling software results; • The freeboard achieved in the S/W design exceeds the minimum 500mm requirement as specified in the GDRS as noted in Section 6.32 of the main Engineering Infrastructure & Stormwater Impact Assessment report; • In reference to Section 6.41, of the main infrastructural report accompanying the application, it is noted that there is additional interception storage volume that has not been subtracted from the required attenuation volume nor has it been added to the available storage volume and is therefore considered to be a safer and more conservative approach to attenuation storage estimation; • SuDS elements included in the pluvial design include rear garden filter drains, roadside filter swales, bio-retention areas, rain gardens, house rainwater butts, “green” & “blue” roofs,		

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
			permeable paving systems, catchpits, filter drains, roadside swales, tree pits, void arch attenuation storage and petrol interceptors. • An overflow flood route map was prepared (Dwg.No.2104C/315) and is included in the appendix of the FRA. These extreme event overflows follow the natural grassland ground contours overland to a low point grassland on the subject site. It is concluded that the requirements have been met and no further assessment is required regarding pluvial flood risk from rainfall. There is also some risk of pluvial flooding resulting from human/mechanical error. The following measures are proposed to alleviate any risk of pluvial flooding as a result of human/mechanical error at the Site[55]: • As part of the assessment for blockages in the system, the MicroDrainage design model was run on the basis that there was a near 100% blockage of the outfall vortex control devices for a 120minute period. Therefore, the model was run with a reduction in the outfall rates from each of the 6No. Hydrobrakes down to 0.1 l/s for a 120min duration in the Q100 + 20% event. These resulting volumes and top water level are contained beneath the ground level in 8 of the 10 storage areas and above ground flooding was noted in storage areas 2 & 3. An above ground flood path/exceedance flow route		

[55] Refer to Flood Risk Assessment, Roger Mullarkey & Associates, May 2024 and Engineering Infrastructure & Stormwater Impact Assessment Report, Roger Mullarkey & Associates, June 2024.

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
			assessment was carried out to determine and manage the flooding routes across the site and these flow routes are represented on dwg.No.2104C/315. Dropped kerbs and profiling of the local landscape will be constructed to direct the overland flows to bunded landscaped areas. Refer to Dwg.No.2104C/315 and to Appendix 12.1 of the FRA for these calculation results. It is concluded that the requirements have been met and no further assessment is required regarding human/mechanical error flood risk.		
	Drought (acute) *Increase in the number of dry periods*	Potential disruption to residential water supply. Increase use of water for the irrigation of the landscaping.	Water supply is on the public water mains, so disruptions should be minimised and mitigated by Irish Water.	Low risk to building. Moderate risk to irrigation of landscaping.	No additional measures proposed.
WIND	**Wind (acute)** Potential increase in the number of windstorms	Potential for damage to infrastructure and telecommunications, and a risk to human health	Suitable exterior materials are used for the building, and maintenance will take place to ensure all exterior materials are safe and fit for purpose. Bins are stored in a secure Bin storage area, which will prevent the risk of causing harm in high winds[56].	Low Risk once existing proposed measures are implemented, and landscaping is maintained in place as designed.	No additional measures proposed.

[56] Refer to Operational Waste Management Plan, Enviroguide, July 2024.

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
OTHER	**Compound events (acute)** *Increase in the number of compound flooding events*	Increased water runoff and pressure on drainage system	Low risk of flooding on Site[57]. Drainage systems have been designed with ample capacity to store any excess storm water, with separate foul and surface water drainage systems to reduce the rate of run-off to the sewer and further reducing the risk of the sewer surcharging[58]. Sustainable urban Drainage Systems (SuDS) (such as rear garden filter drains, roadside filter swales, bio-retention areas, rain gardens, house rainwater butts, "green" & "blue" roofs, permeable paving systems, catchpits, filter drains, roadside swales, tree pits, void arch attenuation storage and petrol interceptors) are proposed to reduce water runoff[59]. CFRAM[60] and the SFRA[61] have been considered within the FRA[62].	Low Risk once existing proposed measures are implemented.	No additional measures proposed. Inspection and maintenance of the drainage systems is carried out periodically and completed in accordance with good practice. The inspection and maintenance of public drains will be the responsibility of DLRCC, and the inspection and maintenance of private drains that serve the communal units will be the responsibility of the Management Company.
	Radiation at surface	Risk to human health	The Radon Map for Ireland [63] indicates that the Application Site is located in an area where about 1 in 5 homes in this area are likely to have high radon levels. McCrossan O'Rourke Manning Architects have confirmed that the scheme will be protected against Radon should that be required at Detail Design stage as	Low Risk once existing proposed measures are implemented.	None proposed.

[57] Refer to Flood Risk Assessment, Roger Mullarkey & Associates, May 2024.
[58] Refer to Engineering Infrastructure & Stormwater Impact Assessment Report, Roger Mullarkey & Associates, June 2024.
[59] Refer to Engineering Infrastructure & Stormwater Impact Assessment Report, Roger Mullarkey & Associates, June 2024.
[60] The Eastern Catchment Flood Risk Assessment & Management Study.
[61] Strategic Flood Risk Assessment (SFRA) prepared as part of the Dun Laoghaire Rathdown County Development Plan 2022-2028 has been considered.
[62] Refer to Flood Risk Assessment, Roger Mullarkey & Associates, May 2024.
[63] EPA Radon Map for Ireland

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
			is a requirement under the Health & Safety Regulations & Building Regulations.		

4.3 Mitigation and Adaptation Measures

The Proposed Development shall seek to achieve the greatest standards of sustainable construction and design and has incorporated sustainable building design criteria from the outset which support overall climate change mitigation, including the requirement that the Development does not exceed the threshold set for the nearly zero-energy building (NZEB) requirements in national regulation implementing Directive 2010/31/EU.

A number of low energy technologies are being considered for the development. The proposed approach to achieving Part L (2022) Compliance will be based on a combination of the solutions as listed below once a detailed analysis has been completed at detailed design stage. A final decision will be made once capital costs, renewable targets and regulation compliance have all been compared to find the most appropriate solution.

The passive measures included in the design, such as minimising solar gain (glazing selection), and reducing the fabric heat loss through the building envelope by improving the airtightness will significantly contribute towards reducing the loads on the active systems within the building. The active measures have been designed to reduce the primary energy consumption through intelligent control and highly efficient plant and equipment.

The building fabric standards and the technology solutions discussed will all be assessed in greater detail during the detailed design stage of the project. A cost benefit analysis of all these available solutions will be carried out to determine the correct balance between an efficient building envelope and the most appropriate combination of technology and renewable energy systems.

Furthermore, the principles of waste management and the circular economy have been incorporated into both the Construction Phase and Operational Phase to ensure that maximum recycling, reuse, and recovery of waste with diversion from landfill, wherever possible, is being achieved. [64]

An Energy Statement[65] and Building Lifecycle Report[66] have been prepared for the Proposed Development which detail potential measures that will aid in the reduction of energy consumption and carbon emissions, these are as follows:

Table 4-2: Energy Efficiency and Carbon Reduction Measures

Measure	Description	Benefit
BER Certificates	A Building Energy Rating (BER) certificate will be provided for each dwelling in the proposed development which will provide detail of the energy performance of the dwellings. A BER is calculated through energy use for space and hot water heating, ventilation, and lighting and	Higher BER ratings reduce energy consumption and running costs.

[64] Refer to Operational Waste Management Plan, Enviroguide, July 2024; and Resource & Waste Management Plan, Enviroguide, July 2024.
[65] Refer to Energy Statement, Waterman Moylan Consulting Engineers Limited, July 2024.
[66] Refer to Building Lifecycle and Management Report, McCrossan O'Rourke Manning Architects, June 2024.

Measure	Description	Benefit
	occupancy. It is proposed to target an A2/ A3 rating for the units, this will equate to the following emissions- A2- 25 to 30kwh/m² with CO2 emissions circa 10kgCO2/m²/ year A3- 51 to 75kwh/m² with CO2 emissions circa 12kgCO2/m²/ year	
Fabric Energy Efficiency	Before considering efficient building services or renewable energy systems, the form and fabric of a building must be assessed and optimised so as to reduce the energy demand for heating, lighting and ventilation. The U-values being investigated will be in line with the requirements set out by the current regulatory requirements of the Technical Guidance Documents Part L, titled "Conservation of Fuel and Energy Buildings other than Dwellings" - 2021. Thermal bridging at junctions between construction elements and at other locations will be minimised in accordance with Appendix D within the Technical Guidance Documents Part L. It is intended that the Acceptable Construction Details (ACDs) will be adhered where suitable and thermal modelling will be carried out for non-standard junction details within proposed development and that the resultant Thermal Bridging Factor will be less than 0.08W/m2K. A major consideration in reducing the heat losses in a building is the air infiltration. This essentially relates to the ingress of cold outdoor air into the building and the corresponding displacement of the heated internal air. This incoming cold air must be heated if comfort conditions are to be maintained. In a traditionally constructed building, infiltration can account for 30 to 40 percent of the total heat loss. With good design and strict on-site control of building techniques, infiltration losses can be significantly reduced, resulting in equivalent savings in energy consumption, emissions and running costs. In order to ensure that a sufficient level of air tightness is achieved, air permeability testing will be specified in tender documents, with the responsibility being placed on the main contractor to carry out testing and achieve the targets identified in the tender documents. A design air permeability target of **3 $m^3/m^2/hr$** will be targeted.	Lower U-values and improved air tightness is being considered to help minimise heat losses through the building fabric, decrease energy consumption and thus minimise carbon emissions to the environment.
Energy Labelled White Goods	The white goods package planned for provision in the dwellings will be of a very high standard and have a high	The provision of high rated appliances in turn reduces the

Measure	Description	Benefit
	energy efficiency rating. It is expected that the below appliance ratings will be provided: Oven - A plus Fridge Freezer - A plus Dishwasher – AAA Washer/Dryer – B	amount of electricity required for occupants.
External Lighting	The proposed lighting scheme within the development consists of 8m, 6m & 5m column mounted LED luminaires, 1.0m LED bollards; locations are indicated on the drawings. The luminaires selected are the C U Phosco E951 & E950 and the TRT VIA bollard, these were selected for the following reasons: • Warm White LEDs • High performance photometrics. • Light spill minimised. • Advanced thermal management. • Maximised savings on energy and maintenance costs. • 100% recyclable.	The site lighting will be designed to provide a safe environment for pedestrians, cyclists and moving vehicles, to deter anti-social behaviour and to limit the environmental impact of artificial lighting on existing flora and fauna in the area. Having Photo electric control units allows for the optimum operation of lighting which minimises costs.
Air Source Heat Pumps	Air source heat pumps utilise grid supplied electricity to extract thermal energy from the external ambient air. The efficiency at which a heat pump operates allows a significant portion of the heat delivered to be considered as renewable. The amount of heat considered to be renewable is determined by the efficiency of the heat pump and the "primary energy conversion factor" for grid supplied electricity.	Higher BER ratings reduce energy consumption and running costs. Typically, approximately 40% to 50% of the heat supplied is considered to be renewable energy.
Combined Heat and Power (CHP)	Combined Heat and Power, (CHP), is a technology being evaluated for this project. This technology generates electricity and captures the waste heat from the generation unit that can be used to heat the building and hot water within the development.	CHP can achieve high energy efficiencies by reusing waste heat from electricity generation for space heating and domestic hot water services in the apartment developments. As electricity from CHP is both generated and consumed onsite, this also eliminates energy losses from transmission of the electricity.
Natural Ventilation	Natural ventilation is being evaluated as a ventilation strategy to minimise energy usage.	The main advantages of natural ventilation is: • Low noise impact for occupants and adjacent units. • Completely passive therefore no energy required. • Minimal maintenance required. • Reduced environmental impact as minimal equipment disposal over life cycle.

Measure	Description	Benefit
		• Full fresh air resulting in healthier indoor environment.
Mechanical Heat Recovery Ventilation	Mechanical heat recovery ventilation (MVHR) will be considered to provide ventilation with low energy usage. MVHR provides tempered fresh air to occupied spaces. Heat is removed from exhaust air stream and transferred into the fresh air supply stream negating the need to use energy to heat the air.	MVHR provides ventilation with low energy usage. The MVHR reduces overall energy and ensures a continuous fresh air supply. MVHR reduces the heating load on the boiler plant by eliminating cold air infiltration.
PV Solar Panels	PV solar panels are being considered which converts the electricity produced by the PV system (which is DC) into AC electricity. The panels are typically placed on the south facing side of the building for maximum heat gain and in some instances, can also be used to assist the heating system.	PV solar panels offer the benefit of reducing fossil fuel consumption and carbon emissions to the environment. They also reduce the overall requirement to purchase electricity from the grid.
ECAR charging points	100 No. electric vehicle charging points are proposed.	Providing the option of E-car charging points will allow occupants to avail of the ever-improving efficient electric car technologies

4.3.1 Energy in Use Measures

The most likely overall solution that will be implemented will include the following measures:

- Meet or exceed minimum U-Value standards.
- Achieve a high level of air tightness (typically 3m3/m2/hr).
- Ensure thermal bridging details are designed to meet the performance of the ACDs or an equivalent standard.
- Provide an appropriate combination of technologies to ensure energy consumption is in line with Part L 2022 requirements. This will typically include air source heat pumps for houses and exhaust air heat pumps for the apartments.
- Install centralised mechanical ventilation systems to ensure adequate ventilation rates are achieved in the dwellings to maximising the benefits of the airtight construction.

4.3.2 Proposed Solutions for Creche

The most likely overall solution that will be implemented will include the following measures:

- Meet or exceed minimum U-Value standards.
- Achieve air tightness standards of 5 m3/m2/hr.
- Provide an air source heat pump and/or PV panels to meet Part L renewable contribution requirements.

4.3.3 Non-Domestic Buildings

The most likely overall solution that will be implemented will include the following measures:

- Exceed minimum U-Value standards.
- Achieve air tightness standards of 5 $m^3/m^2/hr$.
- Provide an air source heat pump and/or PV panels to meet Part L renewable contribution requirements.

4.4 Adaptation Measures

In relation to climate change adaption, overall, the climate risks for the Proposed Development are low based on the Site location and the incorporated design measures. Nevertheless, the following actions are recommended to ensure that these adaptive design measures, particularly in relation to drainage, are capable of operating as intended:

- Inspection and maintenance of HVAC systems is carried out periodically and completed in accordance with good practice. This will be the responsibility of individual property owners / The Management Company where appropriate.

- The correct operation and maintenance of the drainage system is necessary to reduce the risk of human or mechanical error causing pluvial flood risk from blockage. Inspection and maintenance of the drainage systems is carried out periodically and completed in accordance with good practice (particularly after every major storm event, the end of winter (to collect winter debris), mid-summer (to collect dust, flowers and grass-type deposits), and after autumn leaf fall). This will ensure that the drainage systems are capable of managing storm runoff during periods of exceptionally high rainfall. A programme of maintenance measures has been detailed in the Engineering Assessment Report. The inspection and maintenance of public drains will be the responsibility of DLRCC, and the inspection and maintenance of private drains that serve the communal units will be the responsibility of the Management Company.

- It is expected that regular inspection and maintenance of drainage systems will be an effective measure to ensure that the Proposed Development is not at risk of flooding in the future. A regularly maintained drainage system will ensure that it remains effective and in good working order should a large pluvial storm occur. For storms greater than 100-year level, the development has been designed to provide an overland flood route. Additionally, the floor levels of the buildings are set above the 100-year flood levels. However, to account for a worst-case scenario, it is recommended to conduct a risk assessment, as necessary, when deciding the future location and placement of critical infrastructure.

- Risk relating to all changing climate hazards should be revisited and assessed periodically and in line with emerging studies to ensure that proper mitigation and adaptation measures are in place.

The applicant will produce a homeowner's manual which will be provided to the buyer of the development on hand over. This manual will set out the need to carry out routine maintenance of all plant and equipment in order to maximise the efficiency and longer-term running costs etc. The homeowner's manual will also state the need to clear drains and gullies reducing the risk of blockages.

5 DÚN LAOGHAIRE RATHDOWN COUNTY DEVELOPMENT PLAN 2022-2028: RELEVANT POLICY OBJECTIVES

In accordance with DLRCC planning requirements, the preceding sections of this Report have assessed the impact of climate change on the Proposed Development.

The Dún Laoghaire Rathdown County Development Plan 2022-2028 (DLR CDP) sets out a number of policy objectives which contribute towards mitigating and adapting to climate change. The format of the Plan aims to facilitate a holistic approach to ensuring Climate Action is at the forefront of all future development within the County, with a selection of policy objectives in multiple Chapters all contributing to aid in the transition of the County to a climate resilient low carbon society.

The following Table 6-1 demonstrates that the relevant policy objectives produced and implemented by DLRCC in relation to climate change and climate change protection measures, particularly in relation to drainage design, as set out within the Dún Laoghaire Rathdown County Development Plan 2022-2028 (DLR CDP), have been incorporated into the Proposed Development design.

These initiatives not only address local environmental challenges but also advance broader sustainability targets set by the UN. Therefore, each relevant policy objective has also been carefully considered in the context of the UN Sustainable Development Goals (SDGs) as outlined within Table 1-3 of this Report, demonstrating that every mitigative or adaptive action to be included in the Proposed Development also aligns with and contributes to the relevant SDG.

Table 5-1: Relevant Policies for Climate Change and Climate Change Protection Measures adapted from DLRCC Development Plan 2022-2028 and associated SDGs

Policy Objective	Description	Proposed Development Considerations	Relevant SDGs
SUSTAINABLE DEVELOPMENT			
UN1: United Nations Sustainability Goals	It is a Policy Objective of the Council to contribute, as practicable, via this Plan, towards achievement of the 17 Sustainable Development Goals of the United Nations' 2030 Agenda for Sustainable Development.	This Report has considered the Proposed Development's contribution to the SDGs in the context of the DLR CDP 2022-2028.	All SDGs as listed in Table 1-3 of this Report.
URBAN PLANNING			
CS11: Compact Growth	It is a Policy Objective to deliver 100% of all new homes, that pertain to Dublin City and Suburbs, within or contiguous to its geographic boundary. (Consistent with RPO 3.2 of the RSES).	The Proposed Development will be of mixed-use and is located within the boundary of Dublin City and Suburbs as illustrated within Figure 2.9 of the the DLRCC Development Plan 2022-2028. This supports the local authority objective of providing compact, mixed-use urban development to reduce urban sprawl.	
CLIMATE ACTION			
CA4: Dún Laoghaire Rathdown County Council Climate Change Action Plan 2019-2024 (DLR CCAP)	It is a Policy Objective to implement and take account of the Dún Laoghaire-Rathdown County Council Climate Change Action Plan 2019 - 2024 (DLR CCAP), to take account of the 'Climate Action and Low Carbon Development (Amendment) Act 2021', and subsequent updates of both and to transition to a climate resilient low carbon County.	This Report has considered potential impacts of climate change on the Proposed Development and has implemented and taken account of the Dún Laoghaire-Rathdown County Council Climate Change Action Plan 2019 – 2024.	
CA5: Energy Performance in Buildings	It is a Policy Objective to support high levels of energy conservation, energy efficiency and the use of renewable energy sources in existing and new buildings, including retro fitting of energy efficiency measures in the existing building stock.	A number of low energy technologies are being considered for the development. The proposed approach to achieving Part L (2022)	

Policy Objective	Description	Proposed Development Considerations	Relevant SDGs
		Compliance will be based on a combination of the solutions, as detailed in the Energy Statement[67] and listed in Section 4.3 of this Report, once a detailed analysis has been completed at detailed design stage. A final decision will be made once capital costs, renewable targets and regulation compliance have all been compared to find the most appropriate solution. The proposed elements (based on passive and active measures) that will aid in the reduction of energy consumption and carbon emissions, are as follows: • BER Certificates. • Fabric Energy Efficiency. • Energy Labelled White Goods. • Energy Efficient Lighting. • Air Source Heat Pumps. • Combined Heat and Power (CHP). • Centralised Mechanical Ventilation. • Natural Ventilation. • PV Solar Panels. • ECAR Charging Points.	
CA6: Retrofit and Reuse of Buildings	It is a Policy Objective to require the retrofitting and reuse of existing buildings rather than their demolition and reconstruction where possible recognising the embodied energy in existing buildings and thereby reducing the overall embodied energy in construction as set out in the Urban Design Manual (Department of	There are no existing onsite buildings suitable for retrofitting and reuse in the Proposed Development. However, the Proposed Development shall seek to achieve the greatest standards of sustainable construction and design and will have regard to sustainable building design criteria.	

[67] Refer to Energy Statement, Waterman Moylan Consulting Engineers Limited, May 2024.

Policy Objective	Description	Proposed Development Considerations	Relevant SDGs
	Environment Heritage and Local Government, 2009).	A Building Lifecycle Report[68] has been prepared for the Proposed Development on foot of the revised guidelines for Sustainable Urban Housing: Design Standards for New Apartments - Guidelines for Planning Authorities issued under Section 28 of the Planning and Development Act 2000 (as amended) July 2023. The report reviews the outline specification set out for the proposed residential development and explores the practical implementation of the design and material principles which has informed design of building roofs, façades, internal layouts and detailing of the Proposed Development.	 
CA7: Construction Materials	It is a Policy Objective to support the use of structural materials in the construction industry that have low to zero embodied energy and CO_2 emissions.	McCrossan O'Rourke Manning Architects have confirmed that the use of structural materials with low to zero embodied energy and CO_2 emissions will be achieved as much as is practical.	
CA8: Sustainability in Adaptable Design	It is a Policy Objective to promote sustainable approaches to the improvement of standards for habitable accommodation, by allowing dwellings to be flexible, accessible, and adaptable in their spatial layout and design.	The Universal Access Statement[69] sets out how the design of the development complies with the principles of universal design. Technical Guidance Document Part M (2010) shall be adhered to in relation to the design of the units. The design provides for persons/ users with a wide range of abilities and the intention is to make the design appealing to all end users/ residents. There are a wide variety of unit types within the estate to cater for this.	

[68] Refer to Building Lifecycle and Management Report, McCrossan O'Rourke Manning Architects, June 2024.
[69] Refer to Universal Access Statement, McCrossan O'Rourke Manning Architects, June 2024.

Policy Objective	Description	Proposed Development Considerations	Relevant SDGs
		There are a number of high quality landscaped open spaces provided for within the development, with a variety of uses proposed. All the amenity spaces are accessible and useable by all. All dwellings and ground floor apartments with own-door access are accessed at ground floor via a Part M[70] compliant access route from the parking space to the front door. Access to all parts of the site is provided for all users. All dwellings have been designed in compliance with Part M. These provisions allow for future adaptation of the units. A number of EV (Electric Vehicle) parking spaces will be provided, with the possibility of adapting more parking spaces for EV parking in the future. All dwellings are designed to maximise daylight and prevent heat loss. The overall layout and landscaping design will provide a high level of amenity and biodiversity for the future residents and help create character within the development.[71]	
CA9: Radon Gas	It is a Policy Objective, in partnership with other relevant agencies, to promote best practice in the implementation of radon prevention measures.	A High Radon Area is classified by the EPA as any area where it is predicted that 10% or more of homes will exceed the Reference Level of 200 becquerel per cubic metre (Bq/m^3). The Radon Map for Ireland[72] indicates that the Application Site is located in an area where about 1 in 5 homes in this area are likely to have high radon levels. McCrossan O'Rourke Manning Architects have confirmed that the scheme will be protected against Radon should that be required at Detail Design stage as is a requirement under the Health & Safety Regulations & Building Regulations.	

[70] Building Regulations (Part M Amendment) Regulations 2022.
[71] Refer to Landscape Design Statement, NMP Landscape Architecture, 2024.
[72] EPA Radon Map for Ireland

Policy Objective	Description	Proposed Development Considerations	Relevant SDGs
			
CA10: Renewable Energy	Regional, National, and international initiatives and pilot schemes to encourage the development and use of renewable energy sources, including the SEAI Sustainable Energy Community initiatives, as a means of transitioning to a low carbon climate resilient County in line with national renewable energy targets.	The proposed approach to achieving Part L (2022) Renewable Energy Compliance will be based on a combination of the solutions as detailed in the Energy Statement[73] and listed in Section 4.3 of this Report, once a detailed analysis has been completed at detailed design stage. A final decision will be made once capital costs, renewable targets and regulation compliance have all been compared to find the most appropriate solution.	
CA13: Solar Energy Infrastructure	It is a Policy Objective to encourage and support the development of solar energy infrastructure, including photo voltaic (PV) and solar thermal and seasonal storage facilities infrastructure in appropriate locations, as a renewable energy resource which can contribute to the transition to a low carbon climate resilient County. It is also a policy objective to support Ireland's renewable energy commitments by facilitating utility scale PV installations for the production of electricity provided they do not negatively impact upon the environmental quality, amenity or heritage of the area.	Renewable Energy Compliance will be based on a combination of the solutions as detailed in the Energy Statement[74] and listed in Section 4.3 of this Report, once a detailed analysis has been completed at detailed design stage. A final decision will be made once capital costs, renewable targets and regulation compliance have all been compared to find the most appropriate solution.	 

[73] Refer to Energy Statement, Waterman Moylan Consulting Engineers Limited, July 2024.
[74] Refer to Energy Statement, Waterman Moylan Consulting Engineers Limited, July 2024.

Policy Objective	Description	Proposed Development Considerations	Relevant SDGs
CA14: Energy Storage Systems	It is Policy Objective to support the use of efficient energy storage systems and infrastructure that supports energy efficiency and reusable energy system optimization, in accordance with proper planning and sustainable development when these are undertaken in an environmentally acceptable manner.	Renewable Energy Compliance will be based on a combination of the solutions as detailed in the Energy Statement[75] and listed in Section 4.3 of this Report, once a detailed analysis has been completed at detailed design stage. A final decision will be made once capital costs, renewable targets and regulation compliance have all been compared to find the most appropriate solution.	
CA16: Low Emission Vehicles	It is a Policy Objective to support and facilitate the rollout of alternative low emission fuel infrastructure through the Development Management process, prioritising electric vehicle infrastructure.	100 No. electric vehicle charging points are proposed.	
CA17: Electric Vehicles	It is a Policy Objective to support the Government's Electric Transport Programme by progressively electrifying our mobility systems by facilitating the rollout of Electric Powered Vehicle Recharging Parking Bays across the County and on public roads and other suitable location. The provision of e-bike chargers will be supported subject to the availability of Funding.	100 No. electric vehicle charging points are proposed.	
CA18: Urban Greening	It is a Policy Objective to retain and promote urban greening - as an essential accompanying policy to compact growth - which supports the health and wellbeing of the living and working population, building resilience to climate change whilst ensuring healthy placemaking. Significant developments shall include urban greening as a fundamental element of the site and building design incorporating measures such as high-quality biodiverse landscaping	The development will provide vehicular access from Enniskerry Road and Glenamuck Road; vehicular accesses to the future Glenamuck Link Distributor Road; multi-modal links from Enniskerry Road and within the site to the neighbouring "Rockville" development to the north-east and a pedestrian/cycle route through the Dingle Way from Enniskerry Road to the future Glenamuck Link Distributor Road. A key objective of the scheme is to reduce car dependency by providing high quality pedestrian and cycle networks. The provision of green infrastructure integrates the new development with the	

[75] Refer to Energy Statement, Waterman Moylan Consulting Engineers Limited, July 2024.

Policy Objective	Description	Proposed Development Considerations	Relevant SDGs
	(including tree planting), nature-based solutions to SUDS and providing attractive routes and facilities for the pedestrian and cyclist.	existing landscape and allows the opportunity for future links subject to planning. The Landscape Design Statement details the strategies for the retention and enhancement of biodiversity which ensures that the natural, cultural, and health requirements of communities are integrated into, and not compromised by, the new development. The landscape design has been planned in such a way so as to maximise the site's orientation and anticipated microclimate to create habitable, quality spaces which respond to human comfort, encouraging residents and public into a safe and surveilled space. A number of potential routes through the site have been identified to benefit connections with its surroundings and provide a better amenity for the wider community. Pedestrian and cycle routes complement this strategy underpinning the sustainable credentials associated with the development. A number of detailed landscape strategies are proposed within the Landscape Design Statement[76] This green infrastructure strategy follows an overarching strategy of protecting, creating, enhancing, and connecting the natural heritage and biodiversity value of the lands. The provision of trees, along with shrub, wildflower, and bulb planting, are proposed which will maximise the environmental benefits and habitat creation. A number of habitat boxes are also proposed to cater for birds, insects and bats[77]. 'The Dingle Way' is a scheme that allows for the retention of existing mature trees whilst providing a permeable link for the public to utilise, unifying the proposed series of green open spaces and urban plazas. This greenway is a crucial design feature in making this a liveable community, enhancing the marketability of the scheme, improving the quality of residents' lives, and providing space for sustainable drainage. The Proposed Development also provides a pedestrian/cycle route through the Dingle Way from Enniskerry Road to the future Glenamuck Link Distributor Road. The Dingle Way	 

[76] Refer to Landscape Design Statement, NMP Landscape Architecture, 2024.
[77] Refer to Landscape Design Statement, NMP Landscape Architecture, 2024.

Policy Objective	Description	Proposed Development Considerations	Relevant SDGs
		caters for the recreational and amenity requirements of future residents and wider public within the subject lands. Areas of congregation, informal recreation, and exercise provide a varied experience along the greenway, creating a sense of place. Woodland corridor and woodland gardens are also proposed which will provide habitats and wildlife corridors. The corridor will be augmented with further tree planting to protect the existing ones and also utilise a woodland understory planting mix. The route will be planned with seating, sculpture, and opportunities for exercise.[78] Refer to the Landscape Design Statement for further details on the landscape design strategies for the proposal.[79] Sustainable urban Drainage Systems (SuDS) (such as rear garden filter drains, roadside filter swales, bio-retention areas, rain gardens, house rainwater butts, “green” & “blue” roofs, permeable paving systems, catchpits, filter drains, roadside swales, tree pits, void arch attenuation storage and petrol interceptors) are proposed to reduce storm water runoff and increase biodiversity. Refer to the Engineering Infrastructure Report for more detail on the drainage design and each of the listed SuDS measures[80]. An increased number of trees, shrubs, and areas for surface water treatment, coupled with best practice maintenance will ensure a sustainable landscape for the future.	
ENVIRONMENTAL INFRASTRUCTURE AND FLOOD RISK			

[78] Refer to Landscape Design Statement, NMP Landscape Architecture, 2024.
[79] Refer to Landscape Design Statement, NMP Landscape Architecture, 2024.
[80] Refer to Engineering Infrastructure Report and Storm Water Impact Assessment, Roger Mullarkey & Associates, June 2024.

Policy Objective	Description	Proposed Development Considerations	Relevant SDGs
EI2: Irish Water Enabling Policies	It is a Policy Objective in conjunction with Irish Water to promote and support water conservation and demand management measures among all water users in existing and new developments.	The proposed mixed-use development will incorporate measures to reduce water usage through the appropriate selection of low consumption sanitary fittings. Soft actions will be implemented with the aim of informing the building occupants of effective strategies to use less resources, and efficient use of their water. The white goods package planned for provision in the dwellings will be of a very high standard and have a high energy efficiency rating. It is expected that the below appliance ratings will be provided: Oven - A plus Fridge Freezer - A plus Dishwasher - AAA Washer/Dryer – B [81] . This will contribute to reduced water consumption and associated energy costs.	
EI3: Wastewater Treatment Systems	It is a Policy Objective that all new developments in areas served by a public foul sewerage network connect to the public sewerage system, either directly or indirectly.	Uisce Eireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Multi/Mixed Use Development of 492 unit(s) at Enniskerry Road, Kilternan, Dublin, (the Proposed Development). Based upon the details provided, Uisce Eireann have advised that connection to water and wastewater are feasible without infrastructure upgrade.[82]	
EI4: Water Drainage Systems	It is a Policy Objective to require all development proposals to provide a separate foul and surface water drainage system – where practicable	Separate storm and foul water connection services will be provided for the Proposed Development[83].	

[81] Refer to Building Lifecycle and Management Report, McCrossan O'Rourke Manning Architects, June 2024.
[82] Refer to Confirmation of Feasibility Letter, Uisce Eireann, June 2024.
[83] Refer to Engineering Infrastructure & Stormwater Impact Assessment Report, Roger Mullarkey & Associates, June 2024.

Policy Objective	Description	Proposed Development Considerations	Relevant SDGs
			
EI6: Sustainable Drainage Systems	It is a Policy Objective to ensure that all development proposals incorporate Sustainable Drainage Systems (SuDS).	Sustainable urban Drainage Systems (SuDS) (such as rear garden filter drains, roadside filter swales, bio-retention areas, rain gardens, house rainwater butts, "green" & "blue" roofs, permeable paving systems, catchpits, filter drains, roadside swales, tree pits, void arch attenuation storage and petrol interceptors) are proposed to reduce storm water runoff and improve water quality. Refer to the Engineering Infrastructure Report for more detail on the drainage design and each of the listed SuDS measures[84].	 
EI9: Drainage Impact Assessment	It is a Policy Objective to ensure that all new development proposals include a Drainage Impact Assessment that meets the requirements of the Council's Development Management Thresholds Information Document and the Stormwater Management Policy.	Issues within the design relating to surface water drainage implications of the scheme have been examined in the Engineering Infrastructure & Stormwater Impact Assessment Report. This report describes the proposed actions which will improve the stormwater credentials of the scheme[85]. The Engineering Infrastructure & Stormwater Impact Assessment Report details the proposed drainage strategies. This report describes the criteria used to design the storm water discharge, disposal of foul water, water supply[86].	

[84] Refer to Engineering Infrastructure Report and Storm Water Impact Assessment, Roger Mullarkey & Associates, June 2024.
[85] Refer to Engineering Infrastructure & Stormwater Impact Assessment Report, Roger Mullarkey & Associates, June 2024.
[86] Refer to Engineering Infrastructure & Stormwater Impact Assessment Report, Roger Mullarkey & Associates, June 2024.

Policy Objective	Description	Proposed Development Considerations	Relevant SDGs
		The proposed new drainage surface water infrastructure for the development has been designed to cater for flows generated by all storms up to the Q100+20% (climate change) without flooding occurring. The drainage design has also allowed for more than the min.10% Urban Creep allowance as required in the DLRCC Stormwater Management Policy document[87]. See Table 4-1 of this Report for further drainage details.	
EI10: Storm Overflows of Sewage to Watercourses	It is a Policy Objective to work alongside Irish Water to minimise the number and frequency of storm overflows of sewage to watercourses and to establish, in co-operation with the adjoining Local Authorities and Irish Water, a consistent approach to the design, improvement and management of these intermittent discharges to ensure that the needs of the Region's receiving waters are met in a cost-effective manner.	Issues within the design relating to surface water drainage implications of the scheme have been examined in the Engineering Infrastructure & Stormwater Impact Assessment Report. This report describes the proposed actions which will improve the stormwater credentials of the scheme[88].	 
EI12: Waste Management Infrastructure, Prevention, Reduction, Reuse and Recycling (Circular Economy approach)	To ensure new developments are designed and constructed in line with the Council's Guidelines for Waste Storage Facilities	An Operational Waste Management Plan (OWMP) has been prepared to ensure that the management of waste during the Operational Phase of the Proposed Development is undertaken in accordance with the current legal and industry standards. In particular, the OWMP aims to provide a robust strategy for storing, handling, collection and transport of the wastes generated at site whilst ensure maximum recycling, reuse, and recovery of waste with diversion from landfill, wherever possible[89].	

[87] Refer to Flood Risk Assessment, Roger Mullarkey & Associates, May 2024 and Engineering Infrastructure & Stormwater Impact Assessment Report, Roger Mullarkey & Associates, June 2024.

[88] Refer to Engineering Infrastructure & Stormwater Impact Assessment Report, Roger Mullarkey & Associates, June 2024.

[89] Refer to Operational Waste Management Plan, Enviroguide, July 2024.

Policy Objective	Description	Proposed Development Considerations	Relevant SDGs
EI22: Flood Risk Management	It is a Policy Objective to support, in cooperation with the OPW, the implementation of the EU Flood Risk Directive (20010/60/EC) on the assessment and management of flood risks, the Flood Risk Regulations (SI No 122 of 2010) and the Department of the Environment, Heritage and Local Government and the Office of Public Works Guidelines on 'The Planning System and Flood Risk Management' (2009) and relevant outputs of the Eastern District Catchment and Flood Risk Assessment and Management Study (ECFRAMS Study). Implementation of the above shall be via the policies and objectives, and all measures to mitigate identified flood risk.	An FRA[90] has been prepared for the Proposed Development which has assessed the susceptibility of the Site to tidal, fluvial, pluvial, groundwater, and human/mechanical error flooding. In order to conduct the assessment, the following sources of information have been consulted: • OPW's National Flood Information Portal (www.floodinfo.ie); • Guidelines for Planning Authorities on *"The Planning System and Flood Risk Management",* November 2009 (OPW and Department of Environment, Heritage and Local Government); • GDSDS (www.greaterdublindrainage.com); • Dun Laoghaire Rathdown County Development Plan 2022 – 2028 SFRA; • CFRAM (Catchment Flood Risk Assessment and Management). Through site location, careful design, and appropriate mitigation measures, the risks and consequences of flooding have been mitigated across the development.	

[90] Refer to Flood Risk Assessment, Roger Mullarkey & Associates, May 2024.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

To conclude, the Proposed Mixed-Use Development at Wayside, Enniskerry Road and Glenamuck Road, Kilternan, Dublin 18 has demonstrated the potential impacts of climate change on the Proposed Development through the preparation of a Climate Risk and Vulnerability Assessment, which has incorporated the following:

- Climate projections (EPA and IPCC) across a conservative range of future scenarios have been examined, along with the Proposed Development location, to gain an understanding of the future risks that climate change may have on the Proposed Development;

- Screening of potential climate hazards relevant to the location of the Proposed Development and the projected changes in future climate for this location to determine what hazards pose a material risk;

- Assessment of identified material risks, taking account of relevant adaptation and mitigation measures which have been incorporated into the Development design, in accordance with the IPCC's Climate Risk Framework;

- Provision of recommended additional actions to further reduce the potential risks of identified climate hazards.

This Report has met the requirements of DLRCC, as set out within their Development Management Thresholds Information Document, for a Climate Change Impact Assessment which has assessed the impact of climate change on the Proposed Development and ensures that the policies and objectives produced and implemented by the local authority in relation to climate change and climate change protection measures, particularly in relation to drainage design, as set out within the Dún Laoghaire Rathdown County Development Plan 2022-2028 (DLR CDP), have been incorporated into the Proposed Development design. Each relevant policy and objective has also been carefully considered in the context of the UN SDGs, and the Report has demonstrated that every mitigative or adaptive action to be included in the Proposed Development also aligns with and contributes to the associated SDG.

Furthermore, this Report has provided information to support the relevant public body in carrying out its functions in a manner which is consistent with national climate plans and strategies and furthering the achievement of the national climate objective as set out under Section 15 of the Climate Action and Low Carbon Development Act 2015, as amended in 2021. The current CCIA report should be reviewed alongside the relevant and current Local Authority Climate Action plan to ensure alignment with relevant objectives and targets.

This Report can also be utilised by the organisation to prepare for meeting EU sustainability reporting requirements under the Corporate Sustainability Reporting Directive (CSRD) and proposed Corporate Sustainability Due Diligence Directive (CSDD). Specifically, Standard ESRS E1-Climate change within the CSRD and environmental due diligence within the incoming CSDDD. Companies that fall under the scope of the Corporate Sustainability

Reporting Directive (CSRD) also must report in their annual reports to what extent their activities are covered by the EU Taxonomy (Taxonomy-eligibility) and comply with the criteria set in the Taxonomy delegated acts (Taxonomy-alignment).

6.2 Recommendations

6.2.1 Climate Risk and Vulnerability

The Proposed Development shall seek to achieve the greatest standards of sustainable construction and design and has incorporated sustainable building design criteria from the outset which support overall climate change mitigation, including the requirement that the Development does not exceed the threshold set for the nearly zero-energy building (NZEB) requirements in national regulation implementing Directive 2010/31/EU.

The design of the fabric and plant will satisfy the requirements of new Part L Building Regulations and NZEB, once these measures are confirmed at detailed design stage. Compliance will be based on a combination of the solutions as listed within the Energy Statement[91] and Building Lifecycle Report[92] once a detailed analysis has been completed at detailed design stage. A final decision will be made once capital costs, renewable targets and regulation compliance have all been compared to find the most appropriate solution.

The passive measures included in the design, such as minimising solar gain (glazing selection), and reducing the fabric heat loss through the building envelope by improving the airtightness will significantly contribute towards reducing the loads on the active systems within the building. The active measures have been designed to reduce the primary energy consumption through intelligent control and highly efficient plant and equipment.

The following proposed elements (based on passive and active measures), if implemented, will aid in the reduction of energy consumption and carbon emissions:

- BER Certificates.
- Fabric Energy Efficiency.
- Energy Labelled White Goods.
- Energy Efficient Lighting.
- Air Source Heat Pumps.
- Combined Heat and Power (CHP).
- Centralised Mechanical Ventilation.
- Natural Ventilation.
- PV Solar Panels.
- ECAR Charging Points.

[91] Refer to Energy Statement, Waterman Moylan Consulting Engineers Limited, July 2024.
[92] Refer to Building Lifecycle and Management Report, McCrossan O'Rourke Manning Architects, June 2024.

The building fabric standards and the technology solutions listed will all be assessed in greater detail during the detailed design stage of the project. A cost benefit analysis of all these available solutions will be carried out to determine the correct balance between an efficient building envelope and the most appropriate combination of technology and renewable energy systems.

Furthermore, the principles of waste management and the circular economy have been incorporated into both the Construction Phase and Operational Phase to ensure that maximum recycling, reuse, and recovery of waste with diversion from landfill, wherever possible, is being achieved[93].

In relation to climate change adaption, overall, the climate risks for the Proposed Development are low based on the Site location and the incorporated design measures. Nevertheless, the following actions are recommended to ensure that these adaptive design measures, particularly in relation to drainage, are capable of operating as intended:

- Inspection and maintenance of HVAC systems is carried out periodically and completed in accordance with good practice. This will be the responsibility of individual property owners / The Management Company where appropriate.

- The correct operation and maintenance of the drainage system is necessary to reduce the risk of human or mechanical error causing pluvial flood risk from blockage. Inspection and maintenance of the drainage systems is carried out periodically and completed in accordance with good practice (particularly after every major storm event, the end of winter (to collect winter debris), mid-summer (to collect dust, flowers and grass-type deposits), and after autumn leaf fall). This will ensure that the drainage systems are capable of managing storm runoff during periods of exceptionally high rainfall. A programme of maintenance measures has been detailed in the Engineering Assessment Report. The inspection and maintenance of public drains will be the responsibility of DLRCC, and the inspection and maintenance of private drains that serve the communal units will be the responsibility of the Management Company.

- It is expected that regular inspection and maintenance of drainage systems will be an effective measure to ensure that the Proposed Development is not at risk of flooding in the future. A regularly maintained drainage system will ensure that it remains effective and in good working order should a large pluvial storm occur. For storms greater than 100-year level, the development has been designed to provide an overland flood route. Additionally, the floor levels of the buildings are set above the 100-year flood levels. However, to account for a worst-case scenario, it is recommended to conduct a risk assessment, as necessary, when deciding the future location and placement of critical infrastructure.

- Risk relating to all changing climate hazards should be revisited and assessed periodically and in line with emerging studies to ensure that proper mitigation and adaptation measures are in place.

[93] Refer to Operational Waste Management Plan, Enviroguide, July 2024; and Resource & Waste Management Plan, Enviroguide, July 2024.

The applicant will produce a homeowner's manual which will be provided to the buyer of the development on hand over. This manual will set out the need to carry out routine maintenance of all plant and equipment in order to maximise the efficiency and longer-term running costs etc. The homeowner's manual will also state the need to clear drains and gullies reducing the risk of blockages.

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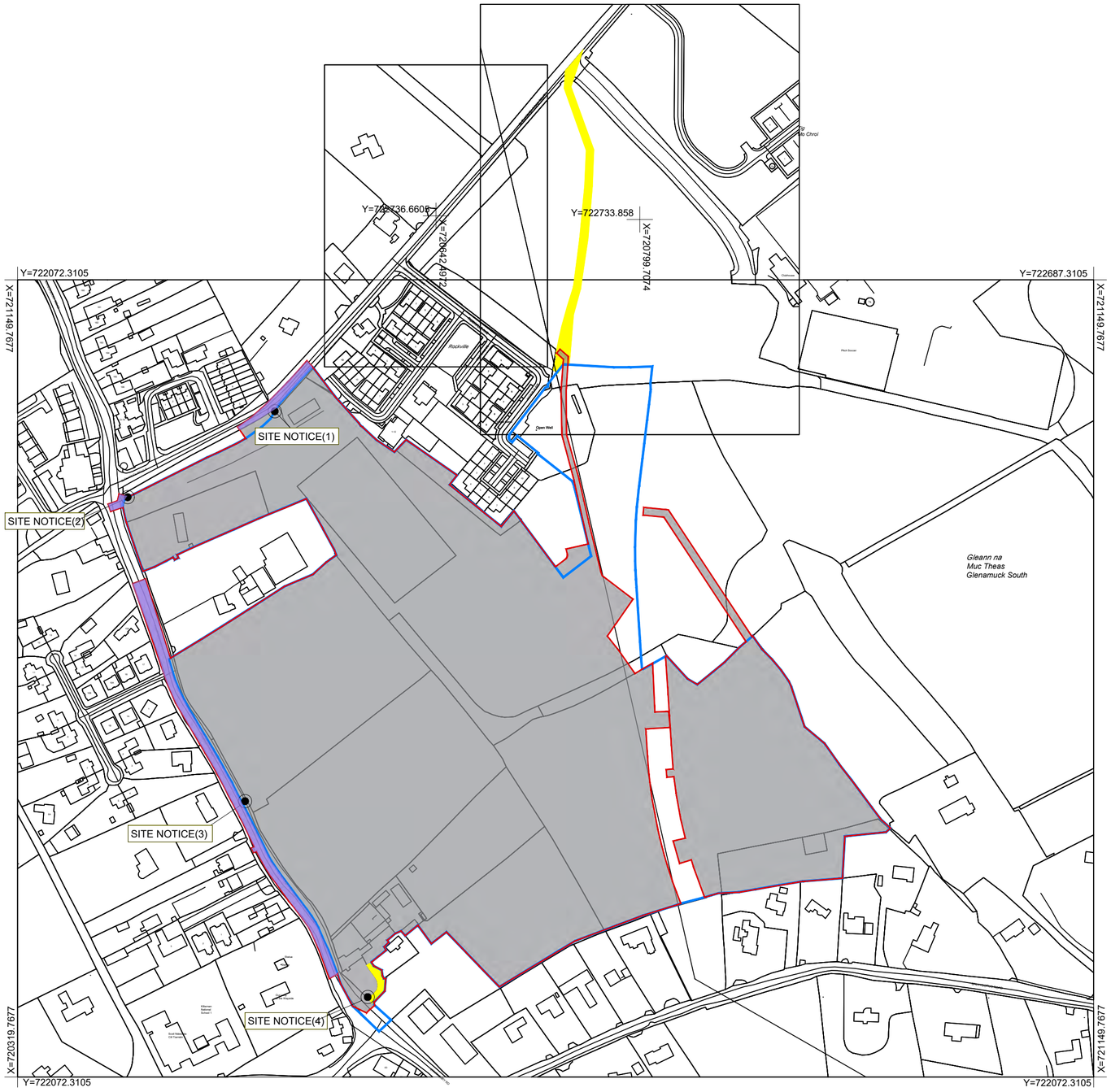
Environmental Consultancy Services

Appendix 1

Site Location and Site Layout



GENERAL NOTES

DO NOT SCALE FROM DRAWINGS. WORK TO FIGURED DIMENSIONS ONLY. ARCHITECT TO BE NOTIFIED OF ANY DISCREPANCIES.

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL ARCHITECT'S DRAWINGS, SPECIFICATIONS CONSULTANT'S DESIGN TEAM DRAWINGS AND SPECIFICATIONS.

N

LEGEND

- SITE BOUNDARY OF PLANNING APPLICATION
- LANDS UNDER CONTROL OF THE APPLICANT
- SITE NOTICE — LOCATIONS OF SITE NOTICES X4
- WAYLEAVE
- WORKS TO ENNISKERRY ROAD AND GLENAMUCK ROAD IN DLR OWNERSHIP (0.319Ha)

REV	DATE	DESCRIPTION	ISSUED BY

REVISIONS

LRD

CLIENT:
LISCOVE_LTD

PROJECT TITLE
KILTERNAN_VILLAGE_LRD

DRAWING TITLE:
SITE_LOCATION_MAP_LRD

DRN BY:	CHK BY:	SCALE:	DATE:	REVISION:	JOB NO:
PC	--	1:2500	JUN'24	--	21009.2

DRAWING NUMBER: PL100

STATUS CODE: --

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GENERAL NOTES

DO NOT SCALE FROM DRAWINGS. WORK TO FIGURED DIMENSIONS ONLY. ARCHITECT TO BE NOTIFIED OF ANY DISCREPANCIES.

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL ARCHITECT'S DRAWINGS, SPECIFICATIONS CONSULTANT'S DESIGN TEAM DRAWINGS AND SPECIFICATIONS.

N

GENERAL NOTES

APPLICATION SITE BOUNDARY OUTLINED IN RED

OWNERSHIP BOUNDARY OUTLINED IN BLUE

REV	DATE	DESCRIPTION	ISSUED BY

REVISIONS

LRD

CLIENT:
LISCOVE_LTD

PROJECT TITLE
KILTERNAN_VILLAGE_LRD

DRAWING TITLE:
SITE_LAYOUT_PLAN

DRN BY:	CHK BY:	SCALE:	DATE:	REVISION:	JOB NO:
LQMD	PM	1:1000	JUNE.24	XX	21009.2

DRAWING NUMBER: PL101

STATUS CODE: XX

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Appendix 2

Appendix A (Classification of climate-related hazards) from Annex II of the Commission Delegated Regulation (EU) 2021/2139.

APPENDIX A: CLASSIFICATION OF CLIMATE-RELATED HAZARDS[669]

	Temperature-related	**Wind-related**	**Water-related**	**Solid mass-related**
Chronic	Changing temperature (air, freshwater, marine water)	Changing wind patterns	Changing precipitation patterns and types (rain, hail, snow/ice)	Coastal erosion
	Heat stress		Precipitation or hydrological variability	Soil degradation
	Temperature variability		Ocean acidification	Soil erosion
	Permafrost thawing		Saline intrusion	Solifluction
			Sea level rise	
			Water stress	
Acute	Heat wave	Cyclone, hurricane, typhoon	Drought	Avalanche
	Cold wave/frost	Storm (including blizzards, dust and sandstorms)	Heavy precipitation (rain, hail, snow/ice)	Landslide
	Wildfire	Tornado	Flood (coastal, fluvial, pluvial, ground water)	Subsidence
			Glacial lake outburst	

669 The list of climate-related hazards in this table is non-exhaustive, and constitutes only an indicative list of most widespread hazards that are to be taken into account as a minimum in the climate risk and vulnerability assessment.

Appendix 8-4 Site Specific Flood Risk Assessment

See Appendix 3-1

Appendix 8-5 Energy Statement

Energy Statement

Kilternan Village LRD, Wayside, Enniskerry Road &
Glenamuck Road, Kilternan, Dublin 18

July 2024

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Client Name:	Liscove Ltd
Document Reference:	Kilternan Village LRD Energy Statement
Project Number:	21-096

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015)

Issue	Date	Prepared by	Checked by	Approved by
00	28/05/2024	Andrew Cruise	Niall Coughlan	Niall Coughlan
01	19/07/2024	Andrew Cruise	Niall Coughlan	Niall Coughlan
02	22/07/2024	Andrew Cruise	Niall Coughlan	Niall Coughlan

Comments

Disclaimer

This report has been prepared by Waterman Moylan, with all reasonable skill, care and diligence within the terms of the Contract with the Client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the Client.

We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report is confidential to the Client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk.

Content

1. Introduction

This Energy Statement has been prepared by Waterman Moylan as part of the planning documentation for a proposed residential development at Kilternan Village, Wayside, Enniskerry Road and Glenamuck Road, Kilternan, Dublin 18.

Liscove Limited intend to apply for permission for a Large-Scale Residential Development on 2 No. sites, measuring c. 14.2 Ha., which will be separated by the future Glenamuck Distributer Link Road (GLDR). The western site principally comprises lands at Wayside, Enniskerry Road and Glenamuck Road, Kilternan, Dublin 18, which include a derelict dwelling known as 'Rockville' and associated derelict outbuildings, Enniskerry Road, Kilternan, Dublin 18, D18 Y199 and the former Kilternan Country Market, Enniskerry Road, Kilternan, Dublin 18, D18 PK09. The western site is generally bounded by the Glenamuck Road to the north; the Sancta Maria property to the north, west and south; a recently constructed residential development named "Rockville" to the north-east; the Enniskerry Road to the south-west; dwellings to the south; and the future GLDR to the east. The eastern site is generally bound by dwellings to the south; the future GLDR to the west; and greenfield land to the north and east.

Road works are proposed to facilitate access to the development from the Enniskerry Road; to the approved Part 8 Enniskerry Road/Glenamuck Road Junction Upgrade Scheme on Glenamuck Road (DLRCC Part 8 Ref. PC/IC/01/17); and to the approved Glenamuck District Roads Scheme (GDRS) (ABP Ref. HA06D.303945) on the Glenamuck Link Distributor Road (GLDR). Drainage and potable water infrastructure is proposed to connect to services on the Glenamuck Road, Enniskerry Road and the GLDR.

At the 'Rockville access point', works are proposed to provide a multi-modal access, including a vehicular connection between the proposed development and the Rockville development (permitted under DLR Reg. Ref. D18A/0566). Surface water and foul drainage infrastructure is proposed to connect into and through the existing/permitted Rockville developments (DLR Reg. Refs. D17A/0793, D18A/0566, D20A/0015 and D23A/0580).

The development will principally consist of: the demolition of c. 740 sq m of existing structures on site comprising a derelict dwelling known as 'Rockville' and associated derelict outbuildings (c. 573 sq m) and the former Kilternan Country Market (wooden structure) (c. 167 sq m); and the provision of a mixed-use development principally consisting of 487 No. residential units (196 No. houses, 201 No. duplex units and 90 No. apartments) and a Neighbourhood Centre. The western site will comprise 362 No. residential units and the Neighbourhood Centre, which will provide an anchor retail store (c. 1,310 sq m), retail/commercial (c. 3,284 sq m), a creche (c. 691 sq m), café (c. 326 sq m), restaurant (c. 182 sq m) and a community facility (c. 332 sq m), and the eastern site will comprise 125 No. residential units. The 487 No. residential units will consist of 53 No. 1 bedroom units (35 No. apartments and 18 No. duplexes), 150 No. 2 bedroom units (38 No. houses, 16 No. apartments and 96 No. duplexes), 236 No. 3 bedroom units (110 No. houses, 39 No. apartments and 87 No. duplexes) and 48 No. 4 bedroom units (48 No. houses). The proposed development will range in height from 2 No. to 4 No. storeys (including podium/undercroft level in Apartment Blocks 1, 2 and 3 and Duplex Blocks T and U on the eastern site).

The development also provides: a pedestrian/cycle route through the Dingle Way from Enniskerry Road to the future Glenamuck Link Distributor Road; 854 No. car parking spaces; motorcycle parking; bicycle parking; bin storage; provision of new telecommunications infrastructure at roof level of the Neighbourhood Centre; private balconies, terraces and gardens; hard and soft landscaping; sedum roofs; solar panels; boundary treatments; lighting; substations; plant; and all other associated site works above and below ground. The proposed development has a gross floor area of c. 60,504 sq m above ground, in addition to an undercroft/basement (c. 4,485 sq m) containing car parking, bike storage, bin storage and plant under Apartment Blocks 1, 2 and 3 and Duplex Blocks T and U on the eastern site.

This report identifies the energy standards with which the proposed development will have to comply and also sets out the overall strategy that will be adopted to achieve these energy efficiency targets.

The dwellings will be required to minimise overall energy use and to incorporate an adequate proportion of renewable energy in accordance with Building Regulations Part L 2022, Conservation of Energy & Fuel (hereinafter referred to as "*Part L 2022 Dwellings*").

2. Building Regulations Part L 2022 Dwellings

Compliance with Building Regulations *Part L 2022 Dwellings* is broken down into six distinct categories, known as Regulation 8; parts (a) to (f).

A summary of each of these parts as listed in Technical Guidance Document L 2011 is provided below together with a description of what is required to demonstrate compliance and suggested routes to meeting the required standards.

2.1 Regulation 8 Part (a)

The regulation requires that:

> *Providing that the energy performance of the building is such as to limit the calculated primary energy consumption and related carbon dioxide (CO2) to that of a nearly zero energy building within the meaning of the Directive insofar as is reasonably*

Part (a) is the overarching compliance target which stipulates the required overall reduction in energy consumption and carbon emissions for new dwellings.

This requires that the energy consumption and carbon emissions of every dwelling is assessed using the DEAP software and that reductions of 70% in energy consumption and 65% in carbon emissions are achieved. The baseline against which this reduction is to be measured is considered to be a dwelling which is constructed to perfectly comply with the 2005 version of Building Regulations Part L.

The ratio of the energy consumed by the proposed dwelling to a similar dwelling constructed to 2005 energy efficiency standards is referred to as the “Energy Performance Co-efficient”

2.2 Regulation 8 Part (b)

The regulation requires that:

> *Providing that, the nearly zero or very low amount of energy required is covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby;*

This requires that the all new dwellings are provided with a renewable energy source. The regulations state that 20% of the total energy consumed within the dwelling must be provided from renewable thermal sources (solar thermal, biomass, heat pumps) or renewable electrical sources (Photovoltaic, Micro-wind).

In practical terms, for a multiple unit development, this requirement is usually met by incorporating PV panels at roof level, incorporating air source heat pump technology or by adding an element of biomass or micro-CHP to a district heating scheme.

Where CHP is included, the renewable energy is considered to be the waste heat which is generated as a by-product of the electricity produced. Specific calculation methods are set out within TGD *Part L 2022 Dwellings* which detail how compliance should be demonstrated.

2.3 Regulation 8 Part (c)

The regulation requires that:

> *Limiting heat loss and, where appropriate, availing of heat gain through the fabric of the building;*

This requires that the fabric of the building is designed to minimise heat loss from the building and that the air permeability of the structure limits the unwanted passage of air into the building.

Typical compliant U-Values are as follows.

Pitched roof	0.16 W/m^{2}K
Flat roof	0.20 W/m^{2}K
Walls	0.18 W/m^{2}K
Floor	0.18 W/m^{2}K
Windows	1.4 W/m^{2}K

The u-values of individual elements can be relaxed if required provided that compensatory measures are taken on other elements and that the overall area weighted u-value for the entire dwelling is the same as it would have been if all individual elements had complied.

The thermal bridging details of junctions in the envelope of the building (floor-wall; wall-window; wall-roof, etc) must also be designed and constructed in accordance with the guidance set out in Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details

Every dwelling must also be subjected to an air pressure test to determine the air tightness. All dwellings must achieve and air tightness of less than 5m^3/m^2/hour when tested at 50 Pascals. In multiple dwelling developments with repeating apartment types, testing can be conducted on a representative sample of units in accordance with Table 1.5.4.3 of TGD *Part L 2022 Dwellings*.

2.4 Regulation 8 Parts (d & e)

The regulation requires that:

> *Providing and commissioning energy efficient space and water heating systems with efficient heat sources and effective controls;*
>
> *Providing that all oil and gas fired boilers shall meet a minimum seasonal efficiency of 90%;*

These require that gas or oil-fired boilers are at least 90% efficient and that heating controls allow independent time control of the heating (2 zones for dwellings larger than 100m^2) and hot water. Heating in each zone should also be controlled by room thermostats (in the case of heating) and cylinder stats (in the case of hot water).

2.5 Regulation 8 Parts (f)

The regulation requires that:

> *Providing to the dwelling owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and energy than is reasonable.*

This requires that information is provided to the dwelling owner which relates to the effective and efficient operation of the systems installed in that dwelling. Instructions on how to control the heating & hot water systems based on time and temperature requirements.

2.6 Requirements for Common Areas

Section 0.1.2.3 requires that:

> *Where a new dwelling forms part of a larger building, the guidance in this document applies to the individual dwelling, and the relevant guidance in Technical Guidance Document L - Conservation of Fuel and Energy – Buildings other than dwellings applies to the non-dwelling parts of the building*

such as common areas (including common areas of apartment blocks), and in the case of mixed-use developments, the commercial or retail space.

This requires that the common areas of the apartment block are design to meet *Part L 2022 BOTD*

for Buildings Other Than Dwellings and will require that a portion of the energy demand for the common areas is met by a renewable energy source.

2.7 S.I No 393 of 2022 - Regulation 5 Part (e)

The regulation requires that:

For a new building (containing one, or more than one, dwelling), where there are more than 10 car parking spaces, ducting infrastructure, consisting of conduits for electric cables, should be provided for every parking space, to enable the subsequent installation of recharging points for electric vehicles where:

- *the car park is located inside the building, e.g. a basement car park; or*
- *the car park is physically adjacent to the building, i.e. the car park is within the curtilage of the site.*

This requires that ducting provision for the future installation of car charging point be made in all carparks with more than 10 parking spaces associated with multi-unit residential buildings.

3. Building Regulations Part L 2022 (Building Other than Dwellings)

Compliance with Building Regulations *Part L 2022 BOTD* is broken down into seven distinct categories, known as Regulation L5 parts (a) to (i).

A summary of each of these parts as listed in Technical Guidance Document L 2022 BOTD is provided below together with a description of what is required to demonstrate compliance and suggested routes to meeting the required standards.

3.1 Regulation L5 Parts (a)

The regulation requires that:

> *(a) providing that the energy performance of the building is such as to limit the calculated primary energy consumption and related Carbon Dioxide (CO2) emissions to a Nearly Zero Energy Building level insofar as is reasonably practicable, when both energy consumption and Carbon Dioxide emissions are calculated using the Non-domestic Energy Assessment Procedure (NEAP) published by Sustainable Energy Authority of Ireland;*

Part (a) is the overarching compliance target which stipulates the required overall reduction in energy consumption and carbon emissions for new commercial buildings.

This requires that the energy consumption and carbon emissions of every building is assessed using the SBEM software and that the energy consumption and carbon emissions associated with the building being assessed are in line with the required standards.

3.2 Regulation L5 Parts (b)

The regulation requires that:

> *providing that, the nearly zero or very low amount of energy required is covered to a very significant extent by energy from renewable sources produced on-site or nearby.*

This requires that Renewable Energy Technologies are provided. This to be reflected by Renewable Energy Ratio (RER) which is the ratio of the primary energy from renewable energy sources to total primary energy as defined and calculated in NEAP. RER for commercial buildings is as follows

- Where the MPEPC of 1.0 and MPCPC of 1.15 is achieved an RER of 0.20
- Where an EPC of 0.9 and a CPC of 1.04 is achieved an RER of 0.10

3.3 Regulation L5 Parts (c)

The regulation requires that:

> *limiting the heat loss and, where appropriate, availing of the heat gains through the fabric of the building.*

This requires that the fabric of the building is designed to minimise heat loss from the building and that the air permeability of the structure limits the unwanted passage of air into the building.

Typical compliant U-Values are as follows.

Pitched roof	0.16 W/m^{2}K
Flat roof	0.20 W/m^{2}K

Walls	0.21 W/m^{2}K
Floor	0.21 W/m^{2}K
Windows	1.6 W/m^{2}K

The u-values of individual elements can be relaxed if required provided that compensatory measures are taken on other elements and that the overall area weighted u-value for the entire building is the same as it would have been if all individual elements had complied.

The thermal bridging details of junctions in the envelope of the building (floor-wall; wall-window; wall-roof, etc) must also be designed and constructed in accordance with Acceptable Construction Details and/or certified details for all key junctions.

Building must also be subjected to an air pressure test to determine the air tightness and must achieve an air tightness of less than 5m^3/m^2/hour when tested at 50 Pascals.

3.4 Regulation L5 Parts (d)

The regulation requires that:

> *providing and commissioning energy efficient space heating and cooling systems, heating and cooling equipment, water heating systems, and ventilation systems, with effective controls.*

This requires that heat- generators should be designed and installed so that they operate efficiently over the range of loading likely to be encountered. This means that gas or oil-fired boilers are at least 86% efficient for output less than 70kW and 93% efficient for output over 70kW. Space and water heating systems should be effectively controlled so as to limit energy use by these systems.

Additionally, buildings should be designed and constructed in such way that there is no requirement for excessive installed capacity of Air Conditioning and Mechanical Ventilation for cooling purposes and the ventilating and cooling systems installed are energy efficient and are capable of being controlled to achieve optimum energy efficiency.

3.5 Regulation L5 Parts (e)

The regulation requires that:

> *ensuring that the building is appropriately designed to limit need for cooling and, where air-conditioning or mechanical ventilation is installed, that installed systems are energy efficient, appropriately sized and adequately controlled.*

This requires that the glazed elements of the proposed building are design to limit solar gain to acceptable levels. Design approaches that are often adopted to address this requirement include reducing total glazing areas, introducing internal or external shading devices, or using specifically selected solar control glazing to reduce the solar gain.

3.6 Regulation L5 Parts (f)

The regulation requires that:

> *limiting the heat loss from pipes, ducts and vessels used for the transport or storage of heated water or air.*

This requires that hot water storage vessels, pipes, and ducts associated with the provision of heating and hot water in a building should be insulated to limit heat loss, except where the heat flow through the wall of the pipe, duct, or vessel is always useful in conditioning the surrounding space.

3.7 Regulation L5 Parts (g)

The regulation requires that:

> *limiting the heat gains by chilled water and refrigerant vessels, and by pipes and ducts that serve air conditioning systems.*

This requires that storage vessels for chilled water and refrigerant, and pipes and ducts that serve air-conditioning systems should be insulated to limit heat gain from the surrounding environment.

3.8 Regulation L5 Parts (h)

The regulation requires that:

> *providing energy efficient artificial lighting systems and adequate control of these systems.*

This requires that artificial lighting systems shall be designed and controlled so as to ensure the efficient use of energy for this purpose. Lighting controls should encourage the maximum use of daylight and help avoiding unnecessary artificial lighting.

3.9 Regulation L5 Parts (i)

The regulation requires that:

> *providing to the building owner or occupants sufficient information about the building, the fixed building services, controls, and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and energy than is reasonable.*

This requires that information is provided to the dwelling owner which relates to the effective and efficient operation of the systems installed in that house. Instructions on how to control the heating & hot water systems based on time and temperature requirements.

3.10 S.I No 393 of 2022 - Regulation 5 Part (e)

The regulation requires that:

> *A building which has more than 10 car parking spaces, that is (i) new, or (ii) undergoing major renovation, shall have installed at least one recharging point and ducting infrastructure (consisting of conduits for electric cables) for at least one in every 5 car parking spaces*

This requires that at least one functioning charging point be provided for carparks with more than 10 parking spaces and that a ducting provision be made for the future installation of additional charging points for one in every 5 spaces.

4. Building Fabric

Before considering efficient building services or renewable energy systems, the form and fabric of a building must be assessed and optimised so as to reduce the energy demand for heating, lighting and ventilation. Target performance levels have been identified by the design team and are presented below.

4.1 Elemental U-Values

The U-Value of a building element is a measure of the amount of heat energy that will pass through the constituent element of the building envelope. Increasing the insulation levels in each element will reduce the heat lost during the heating season and this in turn will reduce the consumption of fuel and the associated carbon emissions and operating costs.

It is the intention of the design team to exceed the requirements of the building regulations. Target U-Values are identified below.

U-Values	**Range of Target Values Proposed**	**Part L 2022 (Dwellings) Compliant Values**
Floor	0.10 to 0.18 W/m^{2}K	0.18W/m^{2}K
Roof (Flat)	0.12 to 0.20 W/m^{2}K	0.20 W/m^{2}K
Roof (Pitched)	0.10 to 0.16 W/m^{2}K	0.16 W/m^{2}K
Walls	0.10 to 0.18 W/m^{2}K	0.18 W/m^{2}K
Windows	0.9 to 1.4 W/m^{2}K	1.4W/m^{2}K

4.2 Air Permeability

A major consideration in reducing the heat losses in a building is the air infiltration. This essentially relates to the ingress of cold outdoor air into the building and the corresponding displacement of the heated internal air. This incoming cold air must be heated if comfort conditions are to be maintained. In a traditionally constructed building, infiltration can account for 30 to 40 percent of the total heat loss, however construction standards continue to improve in this area.

With good design and strict on-site control of building techniques, infiltration losses can be significantly reduced, resulting in equivalent savings in energy consumption, emissions and running costs.

In order to ensure that a sufficient level of air tightness is achieved, air permeability testing will be specified in tender documents, with the responsibility being placed on the main contractor to carry out testing and achieve the targets identified in the tender documents.

A design air permeability target of **3 m^3/m^2/hr** has been identified for the apartments and houses on the site.

The air permeability testing will be carried out in accordance with BS EN 13829:2001 ‘Determination of air permeability of buildings, fan pressurisation method’ and CIBSE TM23: 2000 ‘Testing buildings for air leakage”

4.3 Thermal Bridging

Thermal bridges occur at junctions between planar elements of the building fabric and are typically defined as areas where heat can escape the building fabric due to a lack of continuity of the insulation in the adjoin elements.

Careful design and detailing of the manner in which insulation is installed at these junctions can reduce the rate at which the heat escapes. Standard good practice details are available and are known as Acceptable Construction Details (ACDs). Adherence to these details is known to reduce the rate at which heat is lost.

The rate at which heat is lost is quantified by the Thermal Bridging Factor of the dwelling and measured in W/m2K. The Thermal Bridging Factor is used in the overall dwelling Part L calculation, this value can be entered in three different ways:

0.15W/m^2K	Used where the ACDs are not adhered to
0.08W/m^2K	Used where the ACDs are fully adhered to
< 0.08 W/m^2K	Used where the thermal details are thermally modelled and considered to perform better than the ACDs

It is intended that the ACDs will be adhered where suitable benchmarks exist, and that thermal modelling will be carried out for any non-standard junction details within proposed development and that the resultant Thermal Bridging Factor will be less than 0.08W/m2K for houses. For apartments thermal modelling of non-standard details will not be required and the resultant Thermal Bridging Factor will be 0.15W/m2K.

Confirmation will be required from the Architect and/or Contractor that all key junctions in the scheme have been designed and constructed in accordance with the ACDs.

They will require the following:

- List of thermal bridging junctions in the building, noting all key junctions
- Plan, elevation and section drawings identifying all key junctions and the ACD that are designed and constructed in accordance with signed details sheets of all ACDs used.

5. Heat Sources & Renewable Energy Options & Proposals

All new dwellings must meet overall energy performance levels (as defined by the Energy Performance Coefficient - EPC) and must have a portion of their annual energy demand provided by renewable energy sources.

The renewable energy source can be thermal energy such as solar thermal collection, biomass boilers or heat pumps or it can be electrical energy as generated by photovoltaic solar panels or wind turbines. The minimum renewable energy contributions defined in *Part L 2022 Dwellings* Part (b) is 20% of the total energy consumption for the dwelling.

Two main fuel sources are generally available for developments of this nature, natural gas and electricity. Each present distinct options for compliance with the new standards. Solutions involving gas as the primary fuel source will typically include a solar technology such as PV panels to meet the renewable energy requirements while solutions relying on electricity will include heat pump technology.

The options presented in Sections 4.1 to 4.3 below set out three possible means of complying with *Part L 2022 Dwellings* for the apartments. Each is based on the building fabric performance levels identified in Table 1 in Section 3. Section 4.4 sets out the typical means for complying with *Part L 2022 BOTD* for the landlord areas. Section 4.5 and 4.6 sets out the possible means of complying with *Part L 2022 Dwellings for the houses.*

The final selection and combination of technologies will most likely be selected from these options based on a more in-depth technical and financial appraisal of the technologies which will be carried out during detailed design.

5.1 Apartments Option 1 – Individual Plant with Exhaust Air Heat Pumps

Exhaust Air heat pumps (EAHPs) operate in a very similar manner to the more conventional air source heat pumps and utilise grid supplied electricity to extract thermal energy from a heat source, in this case, the internal air within the apartment. The internal air is extracted from kitchens and wet rooms and is drawn into the heat pump via ductwork in the ceiling void. The heat pump extracts heat from this air before expelling it from the apartment.

As noted in Section 2.2 above, the electricity consumed is not renewable energy but the efficiency at which a heat pump operates allows a significant portion of the heat delivered to the dwelling be considered as renewable.

There are a number of manufacturers offering products of this type and the certified seasonal efficiencies of some models can exceed 450% in heating mode and 170% to 190% in hot water mode. These efficiencies can deliver Part L 2022 compliance in most circumstances but in some instances may need supplementary PV panels in order to meet the required energy targets.

There is no requirement for a separate Mechanical Extract Ventilation (MEV) systems when an exhaust air heat pump is used as the heat pump draws the air from all wet rooms in the same manner as an MEV system would. The fan will run continuously to ensure that the minimum ventilation rates are maintained and the supply air to the dwelling is provided through trickle vents in each habitable room.

5.2 Apartments Option 2 – Electric Heaters, Hot Water Heat Pumps, Heat Recovery Ventilation & PV Panels

This approach includes the provision of electric storage and/or convector heaters in the living & sleeping areas to meet all of the space heating requirements with electric towel rads provided in main bathrooms and en-suites.

The hot water demand is met by a hot water heat pump which utilise grid supplied electricity to extract thermal energy from a heat source in a similar manner to an Exhaust Air Heat Pump. The heat pump is ducted directly to the external façade through insulated supply & exhaust ductwork and uses external air for the hot water needs. It can use up to 3 times less electricity than direct acting water heaters and produces renewable energy to aid Part L compliance.

Heat Recovery Ventilation would then be provided in order meet the ventilation needs of the apartments. Air is extracted from wet rooms and supplied to living spaces via a central unit which contains supply and extract fans and a heat exchanger. This system recovers the heat from the warm air being extracted from the dwelling and uses the heat recovered to raise the temperature of the incoming air stream leading to improved overall efficiency.

PV panels are also then needed to improve the overall renewable energy contribution and improve the overall energy performance of the dwellings. Generally, 1 or 2 PV panels will be required for each apartment.

5.3 Apartments Option 3 - District Heating/Waste Heat

This approach would involve the generation of heat in a central location on the site and the distribution of this heat to each apartment via a network district heating pipework. The central plant used to generate the heat could include Air Source Heat Pumps, Combined Heat and Power (CHP) plan and high efficiency gas fired condensing boilers.

A CHP unit uses gas as its energy source to create electricity which can be utilised within the proposed development. This process of creating electricity results in the generation of “waste heat” which can then be used to meet a proportion of the heating and hot water demands of the housing development. Since the waste heat is captured, it can be considered to be renewable energy and therefore contributes towards the overall 20% renewable energy requirement.

The large Air Source Heat Pumps (ASHPs) operate in the same manner as the smaller units incorporated in houses or apartments but at a larger scale, with outputs of up to 90kW. The heat generated is fed in to the district heating network from where it can be supplied to the apartments. Typically, approximately 40% to 50% of the heat supplied is considered to be renewable energy.

The gas fired boilers act to top-up the heat produced by the CHP and heat pumps by raising the temperature of district heating system to the required level and by supplementing the overall heat production in the coldest periods of the year. Averaged over the year, the gas boilers would meet less than 30% of the total heat demand.

Heating pipework would be installed throughout the scheme to distribute the heat generated in the plant room throughout the apartment development, serving each apartment via a heat interface unit (HIU). The HIU would both control and meter the consumption of heat and hot water within each individual dwelling allowing occupants to set the times they need space heating and ensuring they would be charged accordingly.

The no. of apartments in this scheme is below the threshold where District/Waste Heat Networks become a viable solution. Generally, district heating becomes commercially viable in high density schemes within excess of 200 apartments. This scheme includes 487 No. residential units (196 No. houses, 201 No. duplex and 90 No. apartments) and a Neighbourhood Centre. The relatively low density of the site and the capital

costs associated with the central plant and below ground heating pipework would render a district heating network unviable for this site.

5.4 Apartment Corridors/Landlord Areas

In accordance with the requirements of *Part L 2022 Dwellings*, the common areas within the apartment block are required to meet the requirements of Part L 2022 for "Buildings Other Than Dwellings". Under *Part L 2022 BOTD*, a portion (10% to 20%) of the energy demand of the common areas must be met by a renewable energy source. The energy demand within these spaces will be exclusively provided by electrical energy (lighting, space heating & lifts etc) so a photovoltaic array would be best suited to meet this renewable energy demand. Generally, 10 to 15 PV panels will be required for an unheated landlord core.

5.5 Houses & Duplexes Option 1 - Air Source Heat pumps

Air source heat pumps (ASHPs) utilise grid supplied electricity to extract thermal energy from a heat source, in this case, the external ambient air. While the electricity consumed is obviously not renewable energy, the efficiency at which a heat pump operates allows a significant portion of the heat delivered to be considered as renewable energy. The amount of heat considered to be renewable is determined by the efficiency of the heat pump and the "primary energy conversion factor" for grid supplied electricity. Typically, approximately 40% to 50% of the heat supplied is considered to be renewable energy.

Air source heat pumps require an indoor and an outdoor component. The outdoor unit is the evaporator which extracts the thermal energy from the ambient air while the indoor unit typically includes the heating buffer tanks and the hot water cylinder for the dwelling. The outdoor unit is typically located in the back garden of a dwelling.

In recent years, the design of ASHPs has improved bringing about higher efficiencies and reduced costs. This, in turn, has led to an increase use of this technology in large scale housing developments. Certified seasonal efficiencies of some models can exceed 500% meaning that the use of this technology can easily deliver compliance with *Part L 2022 Dwellings*.

5.6 Houses & Duplexes Option 2 - Electric Heaters, Exhaust Air Hot Water Heat pumps & PV

This approach includes the provision of electric storage and/or convector heaters in the living & sleeping areas to meet all of the space heating requirements with electric towel rads provided in main bathrooms and en-suites.

The hot water demand is met by an exhaust air hot water heat pump which utilise grid supplied electricity to extract thermal energy from a heat source, in this case, the internal air within the apartment. The internal air is extracted from kitchens and wet rooms and is drawn into the heat pump via ductwork in the ceiling void. The heat pump extracts heat from this air before expelling it from the apartment.

There is no requirement for a separate Mechanical Extract Ventilation (MEV) systems when an exhaust air heat pump is used as the heat pump draws the air from all wet rooms in the same manner as an MEV system would. The fan will run continuously to ensure that the minimum ventilation rates are maintained and the supply air to the dwelling is provided through trickle vents in each habitable room.

PV panels are also then needed to improve the overall renewable energy contribution and improve the overall energy performance of the dwellings. Generally, 5 to 7 PV panels will be required for each House.

6. Heat Sources & Renewable Energy Options – Non-Domestic Buildings

All new commercial buildings (Buildings Other Than Dwellings) must meet the overall energy performance standards and have a have a portion of their annual energy demand provided by renewable energy sources as set out in Part L 2022 Dwellings. This can be thermal energy such as ***solar thermal collection***, ***biomass boilers*** or ***heat pumps*** or it can be electrical energy as generated by ***photovoltaic solar panels*** or ***wind turbines.***

The minimum renewable energy contributions for a development of this nature is defined in *Part L 2022 BOTD* L5 Part (b) and is measured by the Renewable Energy Ratio (RER). This is the ratio of the primary energy from renewable energy sources to total primary energy demands of the building. Depending on the overall performance of the building, as measured by the EPC and CPC the required renewable energy contribution is either 20% or 10%.

In order to determine the most efficient and effective means of complying with the requirements of Part L 2022 BOTD Part (b) a detailed assessment of the various renewable energy systems available will be conducted during the design stage using the SBEM calculation methodology.

There is a wide variety of possible solutions for heating, cooling and ventilation of non-domestic buildings which can be tailored to suit the proposed uses of the spaces and to meet the occupancy needs. Some spaces may require mechanical ventilations systems or comfort cooling to meet the required internal comforts levels, while others may simply need heating and natural ventilation. Hot water demands in non-domestic buildings also vary considerably depending on building use.

As part of the detailed design process, an SBEM analysis will be carried out to assess the proposed design solutions for compliance with the requirements of *Part L 2022 BOTD*. Typical design solutions that will be assessed will include the following:

- Water based heating systems incorporating air source heat pumps or condensing gas boilers
- Natural ventilation where possible
- Mechanical ventilation systems incorporating heat recovery and/or heat pump technology
- Comfort cooling where required with invertor driven, R32 air conditioning technology
- LED lighting with occupancy and daylight controls
- Solar renewable energy systems (photovoltaic or solar thermal) if required to meet renewable contribution energy targets

7. Electric Vehicle Charging

All new commercial buildings (residential and non-residential) must make a provision for charging electric vehicles. This applies where more than 10 parking spaces are provided.

For residential buildings, the regulations state that future provision, in the form of cable ducting and capacity on distribution boards and meters etc. be made for all parking spaces associated with multi-unit developments with more than 10 parking spaces.

Electric Vehicle (EV) charging points are provided in accordance with Section 12.4.11 (Electrically Operated Vehicles) of the Dún Laoghaire-Rathdown County Development Plan 2022-2028 which states the following:

"Residential multi-unit developments both new buildings and buildings undergoing major renovations (with private car spaces including visitor car parking spaces) - a minimum of one car parking space per five car parking spaces should be equipped with one fully functional EV. Charging Point. Ducting for every parking space shall also be provided."

The proposed multi-unit residential development includes a total of 500 off-curtilage car parking spaces. The 354 No. spaces for the houses will be ducted to facilitate EV parking. Future provision for all spaces will be required and 20% of spaces will incorporate EV charging points. Since the development will also include Part M compliant accessible spaces, the location of the charging point will be such that it can serve one accessible parking space and one standard parking space.

Therefore, 100 no. of the residential car parking spaces are required to be equipped with EV charging points. Across the development, 100 no. EV charging point-equipped spaces will be provided. Additional ducting will be provided to allow for retrospective installation of additional charging points. In-curtilage car parking spaces can readily be made EV charging point equipped. EV charging facilities will be provided in the residential undercroft parking areas. The location of EV charging point-equipped car parking spaces and the car parking allocation is shown on MCORM drawing no. PL601 – Car Parking Plan.

8. Proposed Solutions and Conclusions

This evaluation considered several different energy systems evaluating both central and individual plant for both heating and renewable energy systems. The recommendations produced from this evaluation are shown below. All of which provide low carbon, low energy heating solutions.

The preceding sections of this report set out the regulatory requirements with which the scheme will have to comply while identifying a number of technologies and design approaches that may be utilised to achieve compliance.

The building fabric standards and the technology solutions discussed will all be assessed in greater detail during the detailed design stage of the project. A cost benefit analysis of all these available solutions will be carried out to determine the correct balance between an efficient building envelope and the most appropriate combination of technology and renewable energy systems.

The proposed approach to achieving Part L Compliance will be based on a combination of the solutions below once a detailed analysis has been completed at detailed design stage. A final decision will be made once capital costs, renewable targets and regulation compliance have all been compared to find the most appropriate solution.

8.1 Apartments

- Meet or exceed minimum U-Value standards identified in *Part L 2022 Dwellings*
- Achieve air tightness standards of 3m^3/m^2/hr.
- Ensure thermal bridging details are designed to achieve thermal bridging factors of 0.15W/m^{2}K.
- Provide an appropriate combination of technologies to ensure energy consumption is in line with *Part L 2022 Dwellings* requirements. This will include individual plant in each apartment (exhaust air heat pumps or electric heaters and hot water heat pumps).
- Install centralised mechanical ventilation systems to ensure adequate ventilation rates are achieved in the dwelling which maximising the benefits of the airtight construction.
- To comply with DMSO258 and DMSO259 district heating has been evaluated and has been deemed not suitable for the development.

8.2 Houses & Duplexes

- Meet or exceed minimum U-Value standards identified in *Part L 2022 Dwellings.*
- Achieve air tightness standards of 3m^3/m^2/hr.
- Ensure thermal bridging details are designed to achieve thermal bridging factors of 0.08W/m^{2}K or less.
- Provide an appropriate combination of technologies to ensure energy consumption is in line with *Part L 2022 Dwellings* requirements. This will include individual plant in each house (air source heat pumps or electric heaters and hot water exhaust air heat pumps).
- Install centralised mechanical ventilation systems to ensure adequate ventilation rates are achieved in the dwelling which maximising the benefits of the airtight construction.

8.3 Landlord Areas

The most likely overall solution that will be implemented will include the following measures:

- Meet or exceed minimum U-Value standards.

- Achieve air tightness standards of 5 $m^3/m^2/hr$.
- Provide PV panels to meet Part L renewable contribution requirements (no. of panels will depend on size and if corridor is heated or unheated corridor) (unheated corridor typically 10-15 PV panels).

8.4 Non-Domestic Buildings

The most likely overall solution that will be implemented will include the following measures.

- Exceed minimum U-Value standards.
- Achieve air tightness standards of 5 $m^3/m^2/hr$.
- Provide an air source heat pump and/or PV panels to meet Part L renewable contribution requirements.

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