CLIMATE CHANGE IMPACT ASSESSMENT REPORT

FOR

STRATEGIC HOUSING DEVELOPMENT

AT

The 'Former Avid Technology site', at the junction of Blackthorn Road and Carmanhall Road Sandyford, Dublin 18

August 2022

ON BEHALF OF CLIENT:

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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 Atlas GP Limited for a proposed strategic housing development at the 'Former Avid Technology site', at the junction of Blackthorn Road and Carmanhall Road Sandyford, Dublin 18. A full project description is in included in Section 1.1 of this report.

The contents of this Report provide dual duty to the requirements as set out in Regulation (EU) 2020/852 of the European Parliament and of the Council (the 'Taxonomy Regulation') for a Climate Risk and Vulnerability Assessment and the Dún Laoghaire-Rathdown County Council (DLRCC) requirements for a Climate Change Impact Assessment as set out in Development Management Thresholds Information Document.

Additionally, this Report provides information to support the Board 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.

In accordance with the Taxonomy Regulation, the purpose of this Report is to determine that the Proposed Development qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining that the Proposed Development causes no significant harm to any of the other environmental objectives as set out within the Regulations.

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 physical climate risks which may affect the performance of the Proposed Development during its expected lifetime have been identified through a climate risk screening. State of the art 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

Atlas GP Limited, intend to apply to An Bord Pleanála for planning permission for a strategic housing development at this site of c.0.99 ha at the 'Former Avid Technology site', at the junction of Blackthorn Road and Carmanhall Road Sandyford, Dublin 18.

The Proposed Development consists of 334 Build to Rent residential apartment units within 4no. apartment blocks and as follows:

- 79 No. Studio;
- 175 No. 1 bed;;
- 80 No. 2 bed;
- All residential units provided with private balconies/terraces to the north/south/east and west elevations;
- Crèche 272sq.m;
- Residential amenity spaces 893sq.m. (including a unit of 146.5 sqm open to the public, resident's gym, business centre, multipurpose room, staff facilities, multimedia/cinema room, shared working space, concierge and games room);
- Height ranging from 5 to 16 storeys (over basement);
- Landscaped communal space in the central courtyard;
- Provision of a new vehicular entrance from Ravens Rock Road and egress to Carmanhall Road;
- Provision of pedestrian and cycle connections;
- 125 No. Car Parking, 6 No. Motorcycle Parking and 447 cycle spaces at ground floor/under croft and basement car park levels;
- Plant and telecoms mitigation infrastructure at roof level.

The Development also includes 2 no. ESB substations, lighting, plant, storage, site drainage works, and all ancillary site development works above and below ground.

See Appendix 1 for Site Layout Plan and Site Location Map.

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.

The purpose of this Regulation is to encourage transparency and consistency in the classification of environmentally sustainable economic activities.

The Taxonomy Regulation requires that organisations meet the following conditions in order to be considered a sustainable economic activity:

- Make a substantive contribution to one of six environmental objectives:
    - Climate Change Mitigation
    - Climate Change Adaptation
    - The Sustainable Use and Protection of Water and Marine Resources
    - The Transition to a Circular Economy
    - Pollution Prevention and Control
    - The Protection and Restoration of Biodiversity and Ecosystems
- Do no significant harm to the other five, where relevant;
- Meet minimum safeguards (as set out by the relevant legislation).
- Comply with relevant technical screening criteria[1].

Commission Delegated Regulation (EU) 2021/2139 [2] (the 'Supplementing Regulation') supplements regulation 2020/852 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.

[1] Specific requirements that must be satisfied to achieve Environmentally Sustainable status under the EU Taxonomy as set out in the Supplementing Regulation (EU) 2020/852.

[2] 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.

1.2.1.1 Technical Screening Criteria Requirements

The Supplementing Regulation establishes the Technical Screening Criteria specific to certain economic activities. The Proposed Development, located on circa 0.99 ha at the junction of Ravens Rock Road and Carmanhall Road, Sandyford, Dublin 18, consists of the construction of a Strategic Housing Development. Therefore, in accordance with Annex II, Section 7.1, of the Supplementing Regulation, activities must comply with relevant technical screening criteria for the "Construction of new buildings". Annex II Section 7.1 sets out the relevant technical screening criteria to the project; these are grouped into two categories:

1. Substantial Contribution to Climate Change Adaptation; and

2. Do no significant harm ('DNSH').

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

Section 5 of this Report, details the specific environmental objectives and technical screening criteria for the "*Do no significant harm ('DNSH')"* category and demonstrates how the Proposed Development meets these criteria.

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 Do No Significant Harm. See Section 6 of this report for Dun Laoghaire Rathdown County Development Plan 2022-2028: Relevant Policy Objectives.

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 (WG) I** 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 2019-2024

In May 2019, DLRCC adopted the Dún Laoghaire Rathdown Climate Change Action Plan 2019 – 2024 (DLR CCAP). The Action Plan is the climate adaptation and mitigation strategy for the County. Included in the actions set out in the DLR CCAP is the requirement to prepare a climate change Chapter in the County Development Plan.

The DLR CCAP provides information on climate change predictions, impacts, and adaptation and mitigation measures, for the Dún Laoghaire-Rathdown Local Authority area. The overarching targets of the DLR CCAP are:

- To achieve a 40% reduction in the Council's greenhouse gas emissions by 2030;

- To make Dublin a climate resilient region, by reducing the impacts of future climate change related events; and

- To actively engage and inform citizens on climate change.

The impacts and adaptation and mitigation measures outlined in the DLR CCAP relate specifically to the Dún Laoghaire-Rathdown regional area. The DLR CCAP is broken down into five key action areas, namely: Energy and Buildings, Transport, Nature-Based Solutions, Resource Management and Flood Resilience (See Figure 1-1). The DLR CCAP sets out the baseline climate adaptation and mitigation assessment, risk and vulnerability assessment, and ambitious target actions for the Council's activities under these five headings.

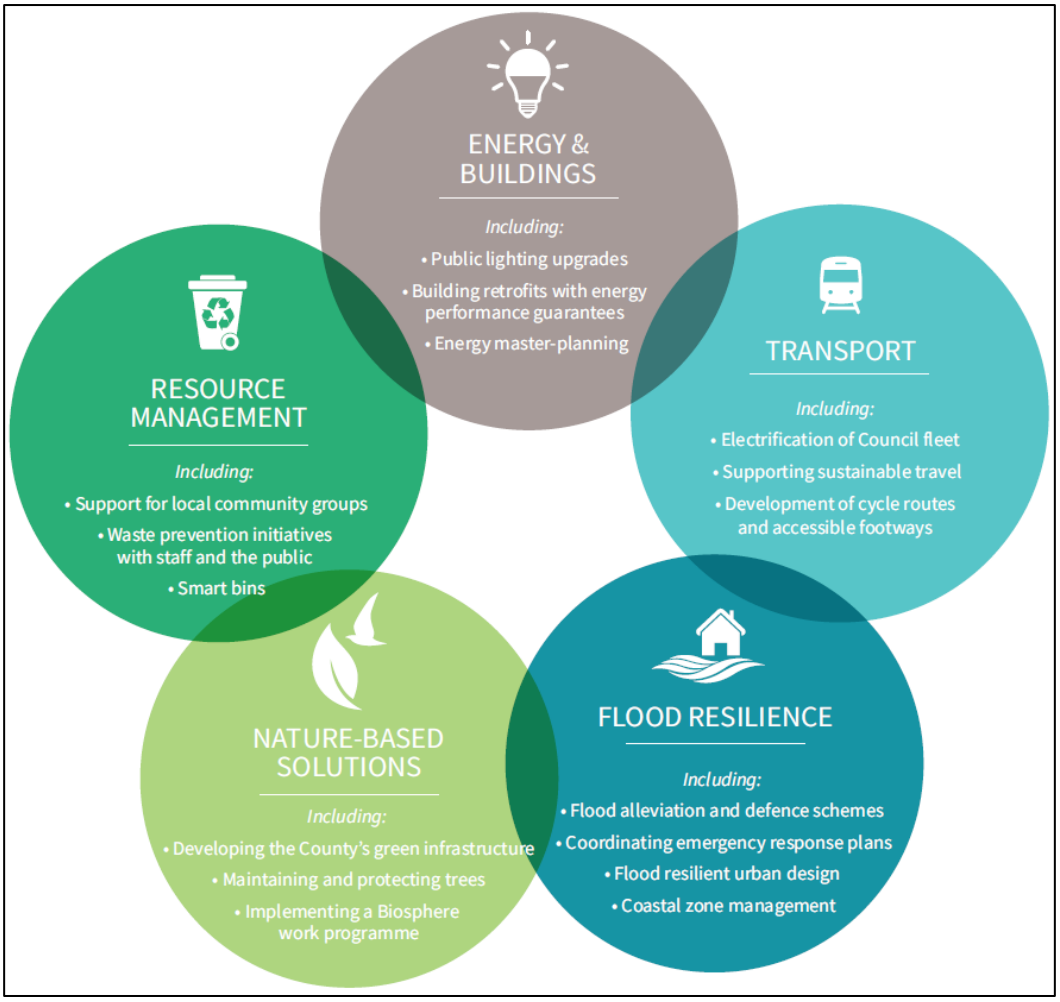

Figure 1-1: The Five Key Action Areas of the CCAP (Source: DLR CCAP)

As a part of the DLR CCAP, a climate change risk and vulnerability assessment was carried out to determine which sectors in Dún Laoghaire-Rathdown would be the most vulnerable to the impacts of Climate Change, and what climate impacts held the highest risk.

In order to determine the effects of a changing climate on Dún Laoghaire-Rathdown, five impact areas were identified that include the different sectors in the County:

1. Critical infrastructure and the built environment;
2. Transport;
3. Biodiversity;
4. Resource management;
5. Water resources.

The impact areas chosen are reflective of the action areas used throughout the CCAP (Energy and Buildings, Transport, Nature-Based Solutions, Resource Management and Flood Resilience), which reflect DLRCC's remit. Once the impact areas were identified, the risk of these areas to a changing climate was determined.

The risk screening methodology employed within the DLR CCAP has been considered in Section 3 of this report. The most applicable sector to the Proposed Development, as defined by DLRCC, is "Critical Infrastructure and the Built Environment".

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 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 taken into account in Section 6 of this report.

1.2.4 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

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

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 2019-2024 (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 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 Board in carrying out its functions under Section 15 of the Climate Action and Low Carbon Development Act 2015, as amended in 2021.

2 CLIMATE CHANGE PROJECTIONS

2.1 Technical Screening Criteria Requirements

The Supplementing Regulation establishes the Technical Screening Criteria specific to certain economic activities. In accordance with Annex II, Section 7.1, of the Supplementing Regulation, activities must comply with relevant technical screening criteria for the "Construction of new buildings" Substantial Contribution to Climate Change Adaptation which 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 the EPA's High-resolution Climate Projections for Ireland (Research Report No. 339)[6]. Due to the expected lifespan of the Proposed Development, climate projections have been provided for mid-term and long-term periods (2041–2060 and 2081–2100, respectively).

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.

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

As per the Taxonomy Regulation, 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).

2.2 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:

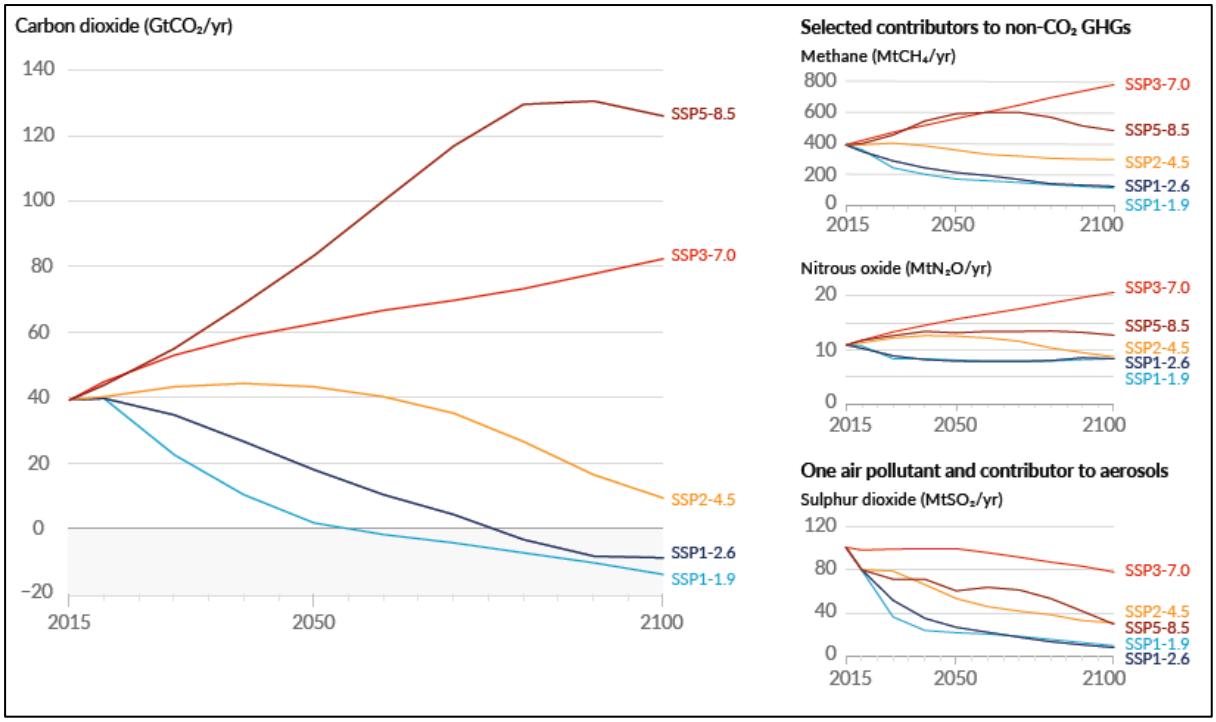

Figure 2-1: Future annual emissions of CO_2 (left) and of a subset of key non-CO_2 drivers (right), across five illustrative scenarios (source: adapted from IPCC AR6 WGI Summary for Policy Makers)

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

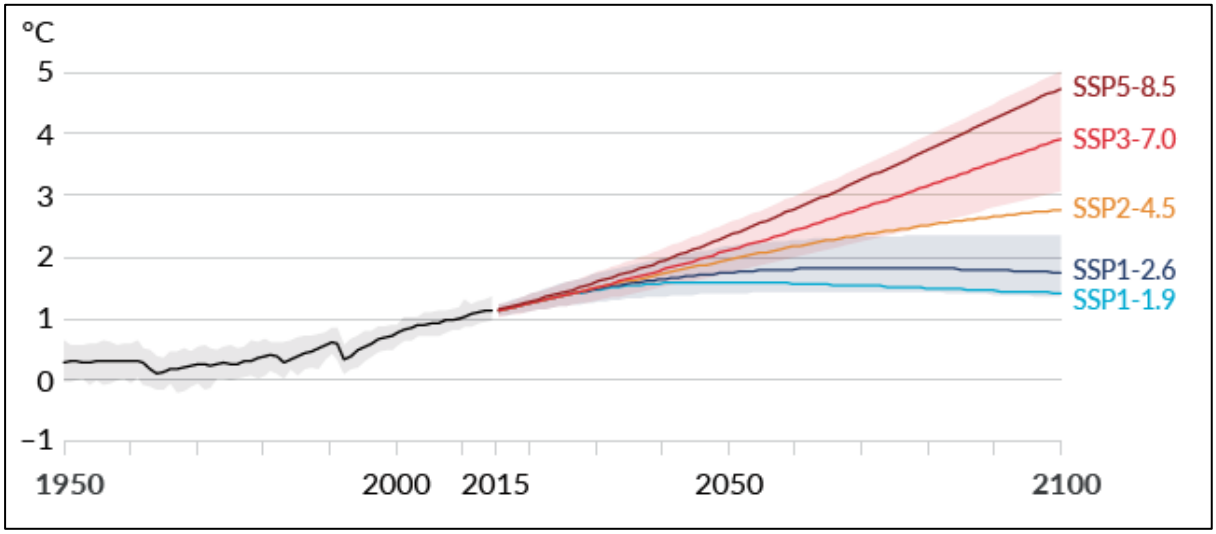

Figure 2-2: global surface temperature change relative to 1850-1900 (source: adapted from IPCC AR6 WGI Summary for Policy Makers)

2.3 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 CO2 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[7]	IPCC WGI Interactive Atlas Data[8] (SSP2-4.5 Scenario)[9]	IPCC WGI Interactive Atlas Data[10] (SSP5-8.5 Scenario)[11]
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 [12] 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: +1.5°C P25-P75: +1.2°C to +1.9°C **Increase in mean temperature in Long Term (2081-2100):** Median: +2.4°C P25-P75: +1.8°C to +3.0°C	**Increase in mean temperature in Medium Term (2041-2060):** Median: +2.0°C P25-P75: +1.5°C to +2.5°C **Increase in mean temperature in Long Term (2081-2100):** Median: +4.4°C P25-P75: +3.6°C to +5.5°C
	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	**Increase in number of days with a maximum temperature above 35°C in Medium Term (2041-2060):** Median: 0.1	**Increase in number of days with a maximum temperature above 35°C in Medium Term (2041-2060):** Median: 0.1

[7] 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.

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

[9] 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.

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

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

[12] 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[7]	IPCC WGI Interactive Atlas Data[8] (SSP2-4.5 Scenario)[9]	IPCC WGI Interactive Atlas Data[10] (SSP5-8.5 Scenario)[11]
		emissions scenario in each European region, and for 1.5°C and 2°C GWLs.	P25-P75: 0 to 0.1 **Increase in number of days with a maximum temperature above 35°C in Long Term (2081-2100):** Median: 0.1 P25-P75: 0 to 0.2	P25-P75: 0 to 0.1 **Increase in number of days with a maximum temperature above 35°C in Long Term (2081-2100):** 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[13]/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):**	**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):**

[13] 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[7]	IPCC WGI Interactive Atlas Data[8] (SSP2-4.5 Scenario)[9]	IPCC WGI Interactive Atlas Data[10] (SSP5-8.5 Scenario)[11]
			Median: 4.9% P25-P75: 2.3% to 7.6%	Median: 10.3% P25-P75: 7.8% to 13.7%
	River Flood Heavy Precipitation and Pluvial Flood (Acute)	There is medium confidence that river floods will decrease in Northern Europe under RCP8.5[14] 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 Medium Term (2041-2060):** Median: 5.9% P25-P75: 4.0% to 7.8% **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 Medium Term (2041-2060):** Median: 8.3% P25-P75: 6.0% to 9.5% **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):**	**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):**

[14] 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[7]	IPCC WGI Interactive Atlas Data[8] (SSP2-4.5 Scenario)[9]	IPCC WGI Interactive Atlas Data[10] (SSP5-8.5 Scenario)[11]
			Median: 8.2% P25-P75: 4.7% to 11.2%	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 P25-P75: 0.1 to 0.11	**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 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[15] 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):**	**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):**

[15] 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[7]	IPCC WGI Interactive Atlas Data[8] (SSP2-4.5 Scenario)[9]	IPCC WGI Interactive Atlas Data[10] (SSP5-8.5 Scenario)[11]
			Median: -1.9% P25-P75: -2.9% to -1.2%	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 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	**Decrease in snowfall (mm/day) in Medium Term (2041-2060):** Median: -3.9 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	**Increase in sea level (metres) in Medium Term (2041-2060):** Median: 0.2

IPCC Climate Impact Driver Category	IPCC Climate Impact Driver (CID) / Climate-related hazard	IPCC AR6 Summary Findings[7]	IPCC WGI Interactive Atlas Data[8] (SSP2-4.5 Scenario)[9]	IPCC WGI Interactive Atlas Data[10] (SSP5-8.5 Scenario)[11]
			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	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 1-in-50-years by 2050 and between 1-in-5-years and 1-in-20-years by 2100.	*No atlas data available for coastal flooding.*	
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.	*No atlas data available for compound events.*	

IPCC Climate Impact Driver Category	IPCC Climate Impact Driver (CID) / Climate-related hazard	IPCC AR6 Summary Findings[7]	IPCC WGI Interactive Atlas Data[8] (SSP2-4.5 Scenario)[9]	IPCC WGI Interactive Atlas Data[10] (SSP5-8.5 Scenario)[11]
		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.		

2.4 Other Relevant Scientific Based Climate Predictions

2.4.1 EPA Climate Projections

Ireland's climate is changing in line with global trends, with a temperature increase of, on average, 0.8°C compared with 1900. 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.

The EPA's Research Report on Climate Projections for Ireland (Research Report No. 339)[16] 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 (3.8 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.

The following Table 2-2 provides a summary of climate projections for Ireland and specific climate model simulations for Dublin; for the purposes of this report, the climate variables

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

observed in the EPA Research Report have been determined as “climate-related hazards” and have been grouped according to the IPCC CID Categories.

Table 2-2: Climate Projections for Ireland (Data Source: EPA Research Report 339)

IPCC Climate Impact Driver Category	Climate-related Hazard	Summary of Projections for Ireland[17]	Climate Model Simulations for Dublin[18] (RCP4.5 Scenario)	Climate Model Simulations for Dublin[18] (RCP8.5 Scenario)
Heat and Cold	Temperature Projections (Chronic)	Mid-century mean annual temperatures are projected to increase by 1–1.2°C and 1.3–1.6°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: +1.2°C Greatest seasonal change in Autumn with an expected increase of +1.5°C	Mean annual temperature change: +1.6°C Greatest seasonal change in Autumn with an expected increase of +1.9°C
	Surface Humidity (Chronic)	Specific humidity[19] is projected to increase substantially (≈10%) for all seasons by the middle of the century. Relative humidity[20] 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[21] (Acute)	The large projected increase in high summer temperatures suggests an increase in the number of heatwave events by the middle of the	Change in daily max temperature: +1.5°C	Change in daily max temperature: +2.1°C

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

[18] Simulations were run for the reference period 1981–2000 and the future period 2041–2060.

[19] 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.

[20] Relative humidity is the ratio of the amount of water vapour present in the air to the greatest amount possible at the same temperature.

[21] Heatwaves are considered as periods of more than 3 consecutive days exceeding the 99th percentile of the daily maximum temperature of the May-to-September season of the control period (1981–2000) (EPA Research Report 339).

IPCC Climate Impact Driver Category	Climate-related Hazard	Summary of Projections for Ireland[17]	Climate Model Simulations for Dublin[18] (RCP4.5 Scenario)	Climate Model Simulations for Dublin[18] (RCP8.5 Scenario)
		century. The increases range from 1 to 8 for the RCP4.5 scenario and from 3 to 15 for the RCP8.5 scenario. A sustained increase in the daily maximum temperature is associated with heatwaves.	Change in the number of heatwave events: 2 to 4	Change in the number of heatwave events: 6 to 8
	Frost and Ice days (Acute)	The large projected decrease in cold nights implies a decrease in the number of frost and ice days by the middle of the century.	Averaged over the whole country, the number of frost days (days when the minimum temperature is <0°C) is projected to decrease by 45%. The number of ice days (days when the maximum temperature is <0°C) is projected to decrease by 68%.	Averaged over the whole country, the number of frost days (days when the minimum temperature is <0°C) is projected to decrease by 58%. The number of ice days (days when the maximum temperature is <0°C) is projected to decrease by 78%.
Wet and Dry	Precipitation (Chronic)	Substantial decreases in precipitation are projected for the summer months, with reductions ranging from ≈0% to 11% for the RCP4.5 scenario and from 2% to 17% for the RCP8.5 scenario. Other seasons, and over the full year, show small projected changes in precipitation. 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 decrease in annual mean rainfall: 6% Percentage decrease in summer rainfall: 0% to 11% Percentage decrease in winter rainfall: 5.3%	Percentage decrease in annual mean rainfall: 5.7% Percentage decrease in summer rainfall: 2% to 17% Percentage Increase in winter rainfall: 1% to 5%

IPCC Climate Impact Driver Category	Climate-related Hazard	Summary of Projections for Ireland[17]	Climate Model Simulations for Dublin[18] (RCP4.5 Scenario)	Climate Model Simulations for Dublin[18] (RCP8.5 Scenario)
	Heavy Precipitation Events (Acute)	Changes in the occurrence of heavy rainfall events are of particular importance because of the link with flooding. The frequencies of heavy precipitation events show notable increases over the year as a whole and in the winter and autumn months, with "likely" projected increases of 5–19%. The projections indicate an increase in the annual number of wet days[22] for the RCP4.5 (mean value 10%) and RCP8.5 (mean value 14%) scenarios. The projected increase in the annual number of very wet days[23] is substantial, with mean values of 21% and 31% for the RCP4.5 and RCP8.5 scenarios, respectively.	Projected increase in the annual number of wet days: 2% to 10% *(It is noted that regional details are not reliable because of a large variability in the ensembles).*	Projected increase in the annual number of wet days: 2% to 14% *(It is noted that regional details are not reliable because of a large variability in the ensembles).*
			Projected increase in the annual number of very wet days: 2% to 22% *(It is noted that regional details are not reliable because of a large variability in the ensembles).*	Projected increase in the annual number of very wet days: 2% to 26% *(It is noted that regional details are not reliable because of a large variability in the ensembles).*
	Dry Periods (Acute)	To quantify the potential impact of climate change on future drought events, the change in the number of dry periods[24] 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%

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

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

[24] 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[17]	Climate Model Simulations for Dublin[18] (RCP4.5 Scenario)	Climate Model Simulations for Dublin[18] (RCP8.5 Scenario)
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% 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.	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
	Storm Track Projections[25] (Acute)	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.		

[25] 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[17]	Climate Model Simulations for Dublin[18] (RCP4.5 Scenario)	Climate Model Simulations for Dublin[18] (RCP8.5 Scenario)
Snow and Ice	Snowfall (Chronic)	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%
Other	Energy Impacts	**Heating degree days[26]:** 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 12–17% and 15–21% for the RCP4.5 and RCP8.5 scenarios, respectively. A clear north-to-south gradient is evident for both RCP scenarios, with the largest decreases in the south. Averaged over the whole country, the expected decreases in HDDs are 14% and 18% for the RCP4.5 and RCP8.5 scenarios, respectively. **Cooling degree days[27]:** 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:** 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%. The largest decreases are noted in the north of the country and for the RCP8.5 scenario.		

[26] 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.

[27] 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

The Commission Delegated Regulation 2021/2139 (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 economic activities:

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[28])

	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	

[28] 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
			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 Site of the Proposed Development is located on circa 0.99 hectares of brownfield land on the south-western corner of the intersection of Carmanhall Road and Ravens Rock Road, Sandyford, Dublin 18. The Site was formerly occupied by Tack Packaging; however, the previous building has now been demolished and the Site is currently vacant.

The northern and western boundaries of the Site are delineated by Carmanhall Road and Ravens Rock Road, respectively, with the site immediately south occupied by a four-storey office building. The site immediately to the west is occupied by a double storey office building. The site slopes from south to north towards Carmanhall Road.

The Site is located approximately 8.8 km south of Dublin City Centre and approximately 4km from the Irish Sea. The Proposed Development is in an urban area where land use is mixed (industrial, commercial, and residential). There is no soil cover mapped on Site; only made ground / artificial surfaces.

The Site falls from southwest to northeast ranging in level from 86.0mOD in the southwest to 84.0mOD in the northeast.

The mapped Quaternary sediments at the Site comprise Till derived from limestones, and the mapped bedrock geology comprises granites of the Northern and Upper Liffey Valley Plutons Formation. 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.

The subject Site is located in the catchment of the Carysfort Maretimo Stream. The Carysfort Maretimo Stream rises to the southwest of Sandyford Village. It flows in a north easterly direction through the Sandyford Business District and Stillorgan and discharges into the Irish Sea in Blackrock where the highest tide level is 4.5 metres OD (Malin). The closest section of the Carysfort Stream to the Proposed Development is more than 200 metres to the southeast of and upstream of the subject site.

The existing Site currently drains surface water, unrestricted, to the public stormwater sewer located on Blackthorn Road to the east of the Site.

According to the Office of Public Works (OPW) Flood Mapping software[29], the Site is not located on lands with a flood risk; this is based on the National Catchment-based Flood Risk Assessment and Management (CFRAM) Programme which identified and mapped the existing and potential future flood hazard and flood risk in the areas at potentially significant risk from flooding, called Areas for Further Assessment (AFAs). This Flood Mapping software utilises two scenarios when assessing flood Risk:

- A mid-range future scenario:
    - using an increase in rainfall of 20% and sea level rise of 500mm; and

- A high-end future scenario:
    - using an increase in rainfall of 30% and sea level rise of 1,000 mm.

It is stated in the Site-Specific Flood Risk Assessment (SSFRA), prepared by Waterman Moylan Consulting Engineers Limited[30], that the risk of flooding from rivers is insignificant and that flood water from the Carysfort Maretimo Stream would flow to the east and the north away from the Site. According to the SSFRA, pluvial flooding is considered to present a potential risk to the Site.

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:

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

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

- **Wind-related:** tornado.

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

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

[29] https://www.floodinfo.ie/map/floodmaps/

[30] Refer to Site Specific Flood Risk Assessment Report, Waterman Moylan Consulting Engineers Limited, July 2022.

- Soil degradation and soil erosion have been omitted as the Site is currently a brownfield Site where historical development has already taken place. Therefore, land use remains largely unchanged. Due to the location and topography of the Site, solifluction, subsidence, and landslides have been excluded in the long-term. Dewatering during construction could lead to destabilisation and/or subsidence of unconsolidated soils and subsoils. The potential for this will be addressed at the design stage and water management will be addressed in the Construction Management Plan/Construction Environmental Management Plan. Any effects that will be managed will be local & the predicted impact on soils in negligible[31].

- 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 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:

[31] Chapter 6.0 (Land, Soils and Geology) of the Environmental Impact Assessment Report, Golder Associates Ireland Limited, July 2022.

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	▽
	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	—

Category	CIDs	Future Changes	
	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 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 Ireland (based on EPA Research Report No. 339)

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	Uncertainty in predictions
	River flood	Predicted increase
	Heavy precipitation and pluvial flood	Predicted increase
	Hydrological drought	Predicted increase
	Agricultural and ecological drought	Predicted increase
WIND	Mean wind speed	Predicted decrease

Category	CIDs	Future Changes
	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 Dún Laoghaire-Rathdown's Climate Change Risk Matrix (DLR CCAP)

The following Table 3-5 has been adapted from the DLRCC Climate Change Action Plan (DLR CCAP). To determine the effects of a changing climate on Dún Laoghaire-Rathdown, five impact areas were identified that include the different sectors in the County. The most applicable sector to the Proposed Development, as defined by DLRCC, is "Critical Infrastructure and the Built Environment". The impact areas chosen are reflective of the action areas used throughout the CCAP (Energy and Buildings, Transport, Nature-Based Solutions, Resource Management and Flood Resilience), which reflect DLRCC's remit. Once the impact areas were identified, the risk of these areas to a changing climate was determined. The influence of future risks on the impact areas was assessed using risk matrices. Risk matrices calculate the overall future risk incurred by the different sectors in Dún Laoghaire-Rathdown. A future risk, as per the DLR CCAP, may be defined as a product of likelihood and consequence. The following Table 3-5 provides an adaptation of DLRCC's Climate Change Risk Matrix for Critical Infrastructure and the Built Environment:

Table 3-5: Dún Laoghaire-Rathdown's Climate Change Risk Matrix for Critical Infrastructure & the Built Environment (Source: adapted from Dún Laoghaire-Rathdown County Council Climate Change Action Plan)

Climate Risk	Description	Parameter	Consequence	Likelihood	Future Risk
Extreme Weather Events	Projected increases in temperature, wind speeds, cold snaps and rainfall will put a stress on the built environment, particularly on critical infrastructure (such as electricity and communication networks) and residential developments (with the most vulnerable populations being particularly at risk)	Cold Snaps	Major	Possible	**Medium**
		Heat Waves	Minor	Likely	**Medium**
		Dry Spells	Moderate	Almost Certain	**High**
		Extreme Rainfall	Major	Possible	**Medium**
		Wind Speeds	Critical	Unlikely	**Medium**

Climate Risk	Description	Parameter	Consequence	Likelihood	Future Risk
Sea Level Rise	Increases in sea levels and wave overtopping, along with increased occurrence of coastal storms, will put the built environment at risk. This will include housing and critical infrastructure, which are typically built along the coast	Sea Level Rise	Critical	Almost Certain	**High**
		Wave Height	Major	Possible	**Medium**
		Tides	Major	Likely	**High**
		Coastal Erosion	Moderate	Possible	**Medium**
		Storm Surges	Major	Unlikely	**Medium**
Flooding	Coastal, fluvial and pluvial flooding will put additional stress and risk on the built environment. This additional risk will cause all areas in the built environment to suffer (businesses, residential, critical infrastructure, etc.)	Coastal and Tidal	Critical	Almost Certain	**High**
		Fluvial	Critical	Almost Certain	**High**
		Pluvial	Major	Likely	**High**

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 Proposed Development Location	DLRCC Risk Level to Critical Infrastructure & the Built Environment (extreme weather events)	Material Risk
HEAT AND COLD	Mean air temperature (chronic)	High	High confidence of increase in Northern Europe. Trends for Ireland indicate an increase in mean air temperature.	-	**Yes**
	Extreme heat (acute)	High	High confidence of increase in Northern Europe. Trends for Ireland indicate an increase in heatwaves.	Medium	**Yes**
	Cold spell (acute)	Low/moderate	High confidence of decrease in Northern Europe. Trends for Ireland indicate a decrease in cold spells.	Medium	**No**
WET AND DRY	River flood (acute)	High	Medium confidence of decrease for Northern Europe. Wet days and very wet days predicted to increase in Ireland.	High	**Yes**
	Heavy precipitation and pluvial flood (acute)	High	High confidence of increase for Northern Europe. Wet days and very wet days predicted to increase in Ireland.	Medium-High	**Yes**
	Landslide (acute)	Low/moderate	Low confidence in direction of change.	-	**No**
	Hydrological Drought [32] (acute)	None/low confidence	Low confidence in direction of change for Northern Europe. Number of dry periods expected to increase in Ireland.	High	**Yes**
	Agricultural and ecological drought (acute)	Low/moderate	Low confidence in direction of change.	-	**No**

[32] 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 Proposed Development Location	DLRCC Risk Level to Critical Infrastructure & the Built Environment (extreme weather events)	Material Risk
	Fire weather (acute)	Low/moderate	Low confidence in direction of change.	-	**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**
	Tropical cyclone (acute)	High	Not relevant for location.	-	**No**
	Sand and dust storm (acute)	Low/moderate	Not relevant for location.	-	**No**
SNOW AND ICE	Permafrost thawing (chronic)	Low/moderate	Not relevant for location.	-	**No**
	Heavy snowfall and ice storm (acute)	Low/moderate	Low confidence in direction of change for Northern Europe. Trends in Ireland predict a decrease in snowfall.	-	**No**
	Hail (acute)	Low/moderate	Low confidence in direction of change.	-	**No**
	Snow avalanche (acute)	Low/moderate	Not relevant for location.	-	**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.	High	**Yes**
	Coastal flood (acute)	High	High confidence of increase in Northern Europe.	High	**Yes**
	Coastal erosion (chronic)	High	High confidence of increase in Northern Europe.	Medium	**Yes**

Category	CIDs	IPCC Impacts and Risk Relevance to the Built Environment	Predicted Change in CID for Proposed Development Location	DLRCC Risk Level to Critical Infrastructure & the Built Environment (extreme weather events)	Material Risk
OTHER	Radiation at surface (chronic)	Low/moderate	Medium confidence of decrease in Northern Europe.	-	**No**
	Compound flooding	High	The probability of these events is projected to increase along northern European coasts	High	**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 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~~	

4 CLIMATE RISK AND VULNERABILITY ASSESSMENT

4.1 Technical Screening Criteria Requirements

The Commission Delegated Regulation 2021/2139 (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 economic activities:

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.*

In accordance with 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[33].

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

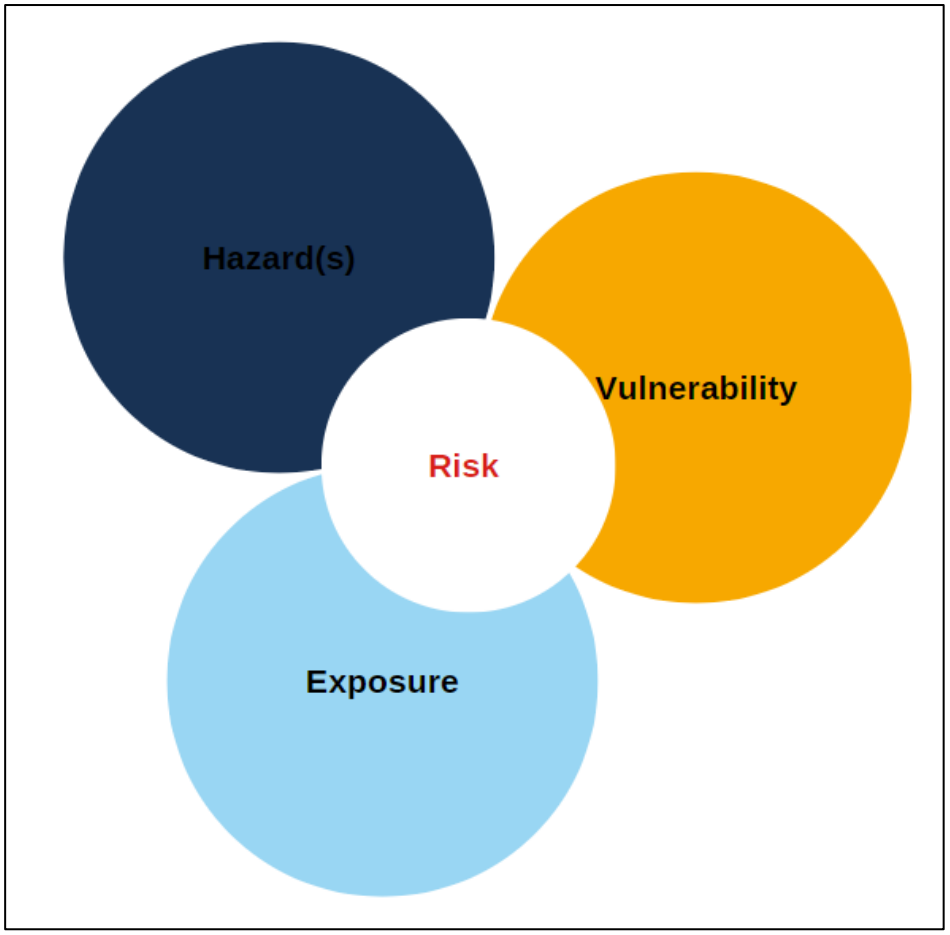

Figure 4-1: IPCC (AR6) Risk Assessment Propeller

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)
- Sea level rise (chronic)
- Coastal erosion (chronic)
- 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 heating and cooling days for the building, extra power usage.	The Site will have at least 80% Extensive and Intensive green roofs, which will have a cooling effect and contribute to the reduction of urban heat island. They will also contribute to biodiversity[34]. Landscaping and the use of trees and plants will shade and contribute to the cooling of the air through evapotranspiration[35]. Centralised group heating system is proposed which is more efficient in terms of energy usage [36]. All-in-one Exhaust Air Heat Pumps to be installed in apartments which will provide a continuous mechanical extract ventilation system[37]. PV / Solar Thermal Array to be installed on roof Supporting the Part L / NZEB requirements in conjunction with Exhaust Air Source Heat Pumps[38]. PV / Solar Thermal Array will offset Primary Energy associated with electricity[39].	Low Risk once existing proposed measures are implemented.	Inspection and maintenance of the PV / solar thermal array and centralised group heating systems is carried out periodically and completed in accordance with good practice.

[34] Refer to Engineering Assessment Report, Waterman Moylan Consulting Engineers Limited, June 2022 – there is a requirement in the DLRCC County Development Plan 2022-2028 regarding the provision of green roofs on new builds.

[35] Evapotranspiration is a term used to refer to the combined processes by which water moves from the earth's surface into the atmosphere.

[36] Refer to Energy Analysis Report, IN2 Engineering Design Partnership, July 2022.

[37] Refer to Building Lifecycle Report, Aramark, July 2022.

[38] Refer to Building Lifecycle Report, Aramark, July 2022.

[39] Refer to Energy Analysis Report, IN2 Engineering Design Partnership, July 2022.

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
	Temperature (acute) *Increase in frequency and duration of heatwave events*	Increased use of Air Conditioning and extra power usage.	Building complies with nZEB (energy efficient) and will have at least 80% green roofs which will have a cooling effect and contribute to the reduction of urban heat island effect. All-in-one Exhaust Air Heat Pumps to be installed in apartments which will provide a continuous mechanical extract ventilation system[40]. PV / Solar Thermal Array to be installed on roof Supporting the Part L / NZEB requirements in conjunction with Exhaust Air Source Heat Pumps[41]. PV / Solar Thermal Array will offset Primary Energy associated with electricity[42].	Low Risk once existing proposed measures are implemented.	Inspection and maintenance of the PV / solar thermal array and centralised group heating systems is carried out periodically and completed in accordance with good practice.
	Precipitation (acute) *Increase in heavy precipitation and pluvial & river flood*	Pressure on drainage systems.	According to the Site-Specific Flood Risk Assessment (SSFRA), there is a low risk of flooding on Site. The site is at an elevation of 86.0mOD in the southwest to 84.0mOD in the northeast which assists in the movement of water away from the Proposed Development. The closest section of the Carysfort Stream to the Proposed Development is more than 200 metres to the southeast of and upstream of the subject site. Given that the site is located some 200 metres away the Carysfort Maretimo Stream and that there is level difference between the subject site and the Stream, there is no pathway between the source and the receptor and associated risk of fluvial flooding are	Low Risk once existing proposed measures are implemented.	Conduct a risk assessment, as necessary, when deciding the future location and placement of critical infrastructure. Inspection and maintenance of the drainage systems is carried out periodically and completed in accordance with good practice.

[40] Refer to Building Lifecycle Report, Aramark, July 2022.

[41] Refer to Building Lifecycle Report, Aramark, July 2022.

[42] Refer to Energy Analysis Report, IN2 Engineering Design Partnership, July 2022.

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
			insignificant. In addition, the various flood maps and reports published by OPW during the past decade confirm the absence of any fluvial flooding in the area of the subject site or its immediate environs[43]. In relation to pluvial flooding, 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 [44]. The risk of flooding is mitigated by providing attenuation for the development which can store water for the 1 in 100-year storm event plus a 20% allowance for climate change and therefore the residual risk is low. Therefore, the likelihood of flooding due to surcharging the existing drainage network is considered low. Sustainable urban Drainage Systems (SuDS) (such as permeable paving, planters, green roofs and podium areas and swales) are in place to reduce water runoff, and CFRAM[45] and the SFRA[46] have been considered[47].		

[43] Refer to Site Specific Flood Risk Assessment Report, Waterman Moylan Consulting Engineers Limited, July 2022. Fluvial Flooding.

[44] Refer to Site Specific Flood Risk Assessment Report, Waterman Moylan Consulting Engineers Limited, July 2022. Pluvial Flooding.

[45]The Eastern Catchment Flood Risk Assessment & Management Study.

[46] Strategic Flood Risk Assessment (SFRA) prepared as part of the Dun Laoghaire Rathdown County Development Plan 2022-2028 has been considered.

[47] Refer to Site Specific Flood Risk Assessment Report, Waterman Moylan Consulting Engineers Limited, July 2022.

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
	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.	Install rainwater harvesting facilities, which would allow for the reuse of water in irrigation of the landscaping[48].
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[49]. A Wind Microclimate Study has been carried out which has determined there to be low wind risk at the site. The prevailing wind directions have been identified as West, South-East and West-South-West, and this has been considered in the Landscaping design[50].	Low Risk once existing proposed measures are implemented, and landscaping is maintained in place as designed.	No additional measures proposed. It is recommended to reassess this climate hazard and its potential risks to buildings should projections in future climate indicate a significant increase in windstorms for this location.
COASTAL AND OCEANIC	**Sea level rise (chronic)**	Increased risk of flooding Increased risk of damage of power and water supply	The subject site is located some 4 km from the Irish Sea at Blackrock at an elevation of 84.0 mOD (Malin) compared to a high tide level of below 5.0m OD (Malin) at Blackrock. The risk from tidal flooding is insignificant. Trees on the site will improve soil stability and structure.	Low Risk.	No additional measures proposed.

[48] Refer to Stage 1 Storm Water Audit, PUNCH Consulting Engineers, June 2022.

[49] Refer to Operational Waste Management Plan, AWN Consulting Ltd., March 2022.

[50] Refer to Wind Microclimate Analysis, B-Fluid, July 2022.

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
	Coastal erosion (chronic)	Increased risk of flooding	The subject site is located some 4 km from the Irish Sea at Blackrock at an elevation of 84.0 mOD (Malin) compared to a high tide level of below 5.0m OD (Malin) at Blackrock. The risk from tidal flooding is insignificant.	Low Risk.	No additional measures proposed.
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[51]. 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[52]. Sustainable urban Drainage Systems (SuDS) (such as permeable paving, planters, green roofs and podium areas and swales) are in place to reduce water runoff, and CFRAM[53] and the SFRA[54] have been considered [55].	Low Risk once existing proposed measures are implemented.	Conduct a risk assessment, as necessary, when deciding the future location and placement of critical infrastructure. Inspection and maintenance of the drainage systems is carried out periodically and completed in accordance with good practice.

[51] Refer to Site Specific Flood Risk Assessment Report, Waterman Moylan Consulting Engineers Limited, July 2022.

[52] Refer to Site Specific Flood Risk Assessment Report, Waterman Moylan Consulting Engineers Limited, July 2022.

[53] The Eastern Catchment Flood Risk Assessment & Management Study.

[54] Strategic Flood Risk Assessment (SFRA) prepared as part of the Dun Laoghaire Rathdown County Development Plan 2022-2028 has been considered.

[55] Refer to Site Specific Flood Risk Assessment Report, Waterman Moylan Consulting Engineers Limited, July 2022.

4.3 Adaptation and Mitigation 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.

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.

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 the PV / solar thermal array and centralised group heating systems is carried out periodically and completed in accordance with good practice.

- Inspection and maintenance of the drainage systems is carried out periodically and completed in accordance with good practice. This will ensure that the drainage systems are capable of managing storm runoff during periods of exceptionally high rainfall.

- 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. However, to account for a worst-case scenario (should such drainage measures fail), it is recommended to conduct a risk assessment, as necessary, when deciding the future location and placement of critical infrastructure. Low level and basement areas should be avoided to prevent potential impacts from pluvial flood events.

- Install rainwater harvesting facilities, which would allow for the reuse of water in irrigation of the landscaping.

- In relation to the increase in windstorms, there is currently uncertainty in the projected change of this climate hazard. Therefore, it is recommended to reassess this climate hazard and its potential risk to buildings should projections in future climate indicate a significant increase in windstorms for this location.

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

These recommended additional measures have been presented to Atlas GP Limited who have accepted them and committed to implementing them.

5 DO NO SIGNIFICANT HARM (DNSH)

The Taxonomy Regulation requires that activities comply with relevant technical screening criteria which includes the requirement to screen and assess the risks of climate change and the Proposed Development's vulnerability to those risks. In addition to this, the Technical Screening Criteria also establishes a requirement that projects "Do No Significant Harm" (DNSH) to other environmental objectives which are specific to the economic activity.

This report has detailed how the Proposed Development will make a substantive contribution to the environmental objective of Climate Change Adaptation. Additionally, in order to demonstrate compliance with the Taxonomy Regulation, it is required that the following environmental objectives are not adversely affected by the Proposed Development:

- Climate Change Mitigation;
- Sustainable use and Protection of Water and Marine Resources;
- Transition to a Circular Economy;
- Pollution Prevention and Control; and
- Protection and Restoration of Biodiversity and Ecosystems.

Associated DNSH criteria are outlined for each of the above-listed objectives within section 7.1 of Annex II of the Supplementing Regulation. The following Table 5-1 demonstrates how the Proposed Development meets the relevant criteria for DNSH and provides recommendations for additional measures, as necessary.

Table 5-1: Technical Screening Criteria for DNSH

Environmental Objective	DNSH Technical Screening Criteria[56]	Relevant Characteristics of the Proposed Development	Recommended Additional Measures
Climate Change Mitigation	The building is not dedicated to extraction, storage, transport or manufacture of fossil fuels.	The Proposed Development is not dedicated to extraction, storage, transport or manufacture of fossil fuels. Its primary use is the provision of residential accommodation and required residential amenities.	None recommended.
	The Primary Energy Demand (PED) setting out the energy performance of the building resulting from the construction does not exceed the threshold set for the nearly zero-energy building (NZEB) requirements in national regulation implementing Directive 2010/31/EU. The energy performance is certified using an as built Energy Performance Certificate (EPC).	The threshold for nearly zero-energy building (NZEB) in Ireland includes the following: • a Maximum Permitted Energy Performance Coefficient (MPEPC) < 0.30 • a Maximum Permitted Carbon Performance Coefficient (MPCPC) < 0.35[57] • a Renewable Energy Ratio (RER) > 0.20 The Energy Analysis Report (IN2 Engineering Design Partnership, 2022) demonstrates the projects compliance with Building Regulations Technical Guidance Document (TGD) Part L 2021 by using Dwelling Energy Assessment Procedure (DEAP) software. The results of this assessment are as follows: • 0.261 MPEPC • 0.259 MPCPC • 0.30 RER Based on this assessment, the project is compliant with the threshold for nearly zero-energy buildings.	None recommended.

[56] As set out in Annex II, Section 7.1 of the Supplementing Regulation.

[57] Figures obtained from section 0.7 of 'Building Regulations Technical Guidance Document L 2021- Conservation of Fuel and Energy – Dwellings'.

Environmental Objective	DNSH Technical Screening Criteria[56]	Relevant Characteristics of the Proposed Development	Recommended Additional Measures
		The Proposed Development is expected to obtain a Building Energy Rating (BER) Certificate of A3/A2[58] once the building has been constructed.	
Sustainable Use and Protection of Water and Marine Resources	Where installed, except for installations in residential building units, the specified water use for the following water appliances are attested by product datasheets, a building certification or an existing product label in the Union, in accordance with the technical specifications laid down in Appendix E to Annex I to this Regulation: a) wash hand basin taps and kitchen taps have a maximum water flow of 6 litres/min; b) showers have a maximum water flow of 8 litres/min; c) WCs, including suites, bowls and flushing cisterns, have a full flush volume of a maximum of 6 litres and a maximum average flush volume of 3,5 litres; d) urinals use a maximum of 2 litres/bowl/hour. Flushing urinals have a maximum full flush volume of 1 litre	The Proposed Development is a residential building, therefore does not require compliance with this screening criteria. However, regarding residential use of water, it is proposed to use flow restrictors on shower heads and low volume flush mechanisms on cisterns with an aim of restricting water usage to 125 litres per person per day[59].	None recommended.
	To avoid impact from the construction site, the activity complies with the criteria set out in Appendix B to this Annex.	The Proposed Development activities comply with the criteria set out in Appendix B of Annex II[60]. An Environmental Impact Assessment has been carried out for the Proposed Development	Auditing of the Construction Phase to ensure that environmental management

[58] A final BER certificate and Advisory Report cannot be obtained until a BER assessment has been carried out at the building following construction, and by an authorised BER assessor.

[59] Refer to Energy Analysis Report, IN2 Engineering Design Partnership, July 2022, Section 3.2.

[60] Appendix 3 of this report contains Appendix B from Annex II of the Supplementing Regulation.

Environmental Objective	DNSH Technical Screening Criteria[56]	Relevant Characteristics of the Proposed Development	Recommended Additional Measures
		in accordance with Directive 2011/92/EU and includes an assessment of the impact on water in accordance with Directive 2000/60/EC.	controls are being implemented to prevent pollution.
Transition to a Circular Economy	At least 70 % (by weight) of the non-hazardous construction and demolition waste (excluding naturally occurring material referred to in category 17 05 04 in the European List of Waste established by Decision 2000/532/EC) generated on the construction site is prepared for reuse, recycling and other material recovery, including backfilling operations using waste to substitute other materials, in accordance with the waste hierarchy and the EU Construction and Demolition Waste Management Protocol. Operators limit waste generation in processes related to construction and demolition, in accordance with the EU Construction and Demolition Waste Management Protocol and taking into account best available techniques and using selective demolition to enable removal and safe handling of hazardous substances and facilitate reuse and high-quality recycling by selective removal of materials, using available sorting systems for construction and demolition waste.	A Resource and Waste Management Plan for the Construction Phase (RWMP)[61] has been prepared which specifies how the waste management & circular economy obligations will be fulfilled. All waste will be managed in accordance with the RWMP. This includes waste ground or surface water, site clearance waste and waste packaging and construction materials generated during construction activities. The management, storage and removal of soils from the Site will also be carried out in accordance with the RWMP.	Auditing of the Construction Phase to ensure that waste management objectives and recycling targets are being fulfilled.
	Building designs and construction techniques support circularity and in particular demonstrate, with reference to ISO 20887573 or other standards for assessing the disassembly or adaptability of buildings, how they are designed to be more	The Architectural Design Statement (McCauley Daye O'Connell Architects, July 2022) details the adaptability and flexibility of the design, and its resource efficiency. The development is designed and finished with durable and low maintenance materials including brick and metal cladding from,	Auditing of the Construction Phase to ensure that environmental management controls are being

[61] Refer to Resource and Waste Management Plan (RWMP) for Construction & Demolition Waste, Waterman Moylan Consulting Engineers Limited, July 2022.

Environmental Objective	DNSH Technical Screening Criteria[56]	Relevant Characteristics of the Proposed Development	Recommended Additional Measures
	resource efficient, adaptable, flexible and dismantlable to enable reuse and recycling.	preferably, local manufacturers. A decommissioning phase for the development has not been considered due to the 'permanent' nature of the development. A Building Lifecycle Report [62] 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) December 2020. 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. 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[63].	implemented to prevent pollution. Auditing of waste management operations during the Operational Phase to ensure maximum recycling, reuse and recovery of waste with diversion from landfill, wherever possible.

[62] Refer to Building Lifecycle Report, Aramark, July 2022.

[63] Refer to Operational Waste Management Plan, AWN Consulting, July 2022.

Environmental Objective	DNSH Technical Screening Criteria[56]	Relevant Characteristics of the Proposed Development	Recommended Additional Measures
Pollution Prevention and Control	Building components and materials used in the construction comply with the criteria set out in Appendix C to this Annex.	The Proposed Development will not lead to the manufacture, placing on the market or use of any of the substances listed in Appendix C of Annex II[64].	None recommended.
	Building components and materials used in the construction that may come into contact with occupiers emit less than 0,06 mg of formaldehyde per m^3 of material or component upon testing in accordance with the conditions specified in Annex XVII to Regulation (EC) No 1907/2006 and less than 0,001 mg of other categories 1A and 1B carcinogenic volatile organic compounds per m^3 of material or component, upon testing in accordance with CEN/EN 16516575 or ISO 16000-3576 or other equivalent standardised test conditions and determination methods.	McCauley Daye O'Connell Architects have confirmed that all building components and materials used in the construction of the Proposed Development that may come into contact with occupiers emit less than 0,06 mg of formaldehyde per m^3 of material or component upon testing in accordance with the conditions specified in Annex XVII to Regulation (EC) No 1907/2006 and less than 0,001 mg of other categories 1A and 1B carcinogenic volatile organic compounds per m^3 of material or component, upon testing in accordance with CEN/EN 16516575 or ISO 16000-3576 or other equivalent standardised test conditions and determination methods.	Auditing of the Construction Phase to ensure that environmental management controls are being implemented to prevent pollution.
	Where the new construction is located on a potentially contaminated site (brownfield site), the site has been subject to an investigation for potential contaminants, for example using standard ISO 18400578.	A site investigation has been completed by AECOM Consulting Engineers which includes an investigation of the potential for contamination of the ground and water environment at the site. The findings of the site investigation have informed whether further investigation and/or remediation is required. Any contaminated soils that are removed from the site will be handled in accordance with the Resource and Waste Management Plan (RWMP) and good practice guidance.	Auditing of the Construction Phase to ensure that environmental management controls are being implemented to prevent pollution.
	Measures are taken to reduce noise, dust and pollutant emissions during construction or maintenance works.	The Construction Environmental Management Plan (CEMP) (Golder Associates Ireland Limited, 2022) outlines the measures	Auditing of the Construction Phase to ensure that environmental management

[64] Appendix 4 of this report contains Appendix C from Annex II of the Supplementing Regulation.

Environmental Objective	DNSH Technical Screening Criteria[56]	Relevant Characteristics of the Proposed Development	Recommended Additional Measures
		that will be taken to reduce noise, dust, and pollutant emissions during construction and / or maintenance works.	controls are being implemented to prevent pollution.
	The activity complies with the criteria set out in Appendix D to this Annex.	In accordance with Appendix D of Annex II[65], an Environmental Impact Assessment has been carried out in accordance with Directive 2011/92/EU and the required mitigation and compensation measures for protecting the environment will be implemented. An Appropriate Assessment Screening Report has also been carried out which has determined that the Proposed Development will not adversely affect any Natura 2000 sites (Golder Associates Ireland Limited, April 2022).	Auditing of the Construction Phase to ensure that environmental management controls are being implemented to avoid adverse ecological impacts.
Protection and restoration of biodiversity and ecosystems	The new construction is not built on one of the following: a) arable land and crop land with a moderate to high level of soil fertility and below ground biodiversity as referred to in the EU LUCAS survey; b) greenfield land of recognised high biodiversity value and land that serves as habitat of endangered species (flora and fauna) listed on the European Red List or the IUCN Red List; c) land matching the definition of forest as set out in national law used in the national greenhouse gas inventory, or where not available, is in accordance with the FAO definition of forest.	The Site of the Proposed Development is a brownfield site where historical development has already taken place. Continuous monitoring and inspection will take place during the Construction Phase to ensure that that various environmental protection, waste management, and pollution prevention procedures and targets are implemented and achieved.	Auditing of the Construction Phase to ensure that environmental management controls are being implemented to avoid adverse ecological impacts.

[65] Appendix 5 of this report contains Appendix D from Annex II of the Supplementing Regulation.

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

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

The following Table 6-1 demonstrates that the relevant policies and 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:

Table 6-1: Relevant Policy Objectives for Climate Change and Climate Change Protection Measures adapted from DLRCC Development Plan 2022-2028

Policy Objective	Description	Proposed Development Considerations
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.	Energy analysis[66] has been undertaken for the Proposed Development in order to demonstrate compliance to Building Regulations Technical Guidance Document (TGD) Part L 2021. PV / Solar Thermal Array to be installed on roof Supporting the Part L / NZEB requirements in conjunction with Exhaust Air Source Heat Pumps[67]. PV / Solar Thermal Array will offset Primary Energy associated with electricity[68].
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 Environment Heritage and Local Government, 2009).	Existing onsite buildings have not been deemed fit for purpose in the Proposed Development and have been demolished. 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.

[66] Refer to Energy Analysis Report, IN2 Engineering Design Partnership, July 2022.

[67] Refer to Building Lifecycle Report, Aramark, July 2022.

[68] Refer to Energy Analysis Report, IN2 Engineering Design Partnership, July 2022.

Policy Objective	Description	Proposed Development Considerations
		A Building Lifecycle Report [69] 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) December 2020. 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.	McCauley Daye O'Connell Architects have confirmed the following in relation to the materials strategy employed by the Proposed Development: • The development is designed and finished with durable and low maintenance materials including brick and metal cladding from, preferably, local manufacturers. • Clay brick is used as a prime finish. It is very easy to produce, resistant, and durable to all weather conditions. Its production is very simple and can be done locally. Averaging on 345kg embodied carbon per m^3, it puts Clay Brick as a good choice of material for constructing buildings with carbon footprint in mind. • The design and construction methods allow for achieving A+ rating as per the BRE Green Guide to Specification.
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.	According to the Architectural Design Statement[70], all apartments in the development are provided with an open plan kitchen, living and dining room which allows for flexibility in use and arrangement. The internal walls

[69] Refer to Building Lifecycle Report, Aramark, July 2022.

[70] Refer to Architectural Design Statement, McCauley Daye O'Connell Architects, July 2022.

Policy Objective	Description	Proposed Development Considerations
		of apartments are designed to be nonstructural. This allows for easy future adaptations to layouts. All dwellings are designed to maximise daylight and prevent heat loss. The overall layout and landscaping design will provide a high level of amenity for the future residents and help create individual character areas within the development.
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.	All new homes in High Radon Areas need to be installed with a radon barrier. 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 (EPA, 2022) indicates that the Application Site is located in an area where between 5% and 10% of homes are estimated to be above the radon reference level; therefore, the Site is not located within a high radon area.
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.	PV / Solar Thermal Array to be installed on roof Supporting the Part L / NZEB requirements in conjunction with Exhaust Air Source Heat Pumps[71]. PV / Solar Thermal Array will offset Primary Energy associated with electricity[72].
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	With regards to renewable energy technology types, the most effective for integration within apartment design to ensure compliance with Building Regulations Technical Guidance Document (TGD) Part L 2021 in a cost-effective manner are: • Air Source Heat Pumps (ASHP): Reduces Primary Energy associated with both Heating and Hot Water compared to gas boilers.

[71] Refer to Building Lifecycle Report, Aramark, July 2022.

[72] Refer to Energy Analysis Report, IN2 Engineering Design Partnership, July 2022.

Policy Objective	Description	Proposed Development Considerations
	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.	• Exhaust Air Heat Pump (EAHP): Reduces Primary Energy associated with both Heating and Hot Water compared to gas boilers. • Photovoltaics (PV): Offsets Primary Energy associated with electricity. Most cost-effective where installed as part of Centralised plant arrangement, with single array interlinked to Landlord electricity supply (as opposed to individual units). PV / Solar Thermal Array to be installed on roof Supporting the Part L / NZEB requirements in conjunction with Exhaust Air Source Heat Pumps[73]. PV / Solar Thermal Array will offset Primary Energy associated with electricity[74].
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.	PV / Solar Thermal Array to be installed on roof Supporting the Part L / NZEB requirements. This will offset Primary Energy associated with electricity[75].
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.	According to the Utilities Report[76], the development will include Electric Vehicle charging points to 25 No. spaces (more than 20%) of the parking spaces provision. There will be EV charging infrastructure, comprising cable ducting systems, cable ladders, cable trays, cable trunking systems, conduit, etc., provided to every parking space (125 No. in total) in compliance with Part L 2021 building regulation requirements.

[73] Refer to Building Lifecycle Report, Aramark, July 2022.

[74] Refer to Energy Analysis Report, IN2 Engineering Design Partnership, July 2022.

[75] Refer to Energy Analysis Report, IN2 Engineering Design Partnership, July 2022.

[76] Refer to Utilities Report, IN2 Engineering Design Partnership, July 2022.

Policy Objective	Description	Proposed Development Considerations
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.	According to the Utilities Report[77], the development will include Electric Vehicle charging points to 25 No. spaces (more than 20%) of the parking spaces provision. There will be EV charging infrastructure, comprising cable ducting systems, cable ladders, cable trays, cable trunking systems, conduit, etc., provided to every parking space (125 No. in total) in compliance with Part L 2021 building regulation requirements.
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 (including tree planting), nature-based solutions to SUDS and providing attractive routes and facilities for the pedestrian and cyclist.	According to the Architectural Design Statement[78], the public spaces provided within the scheme enhance the urban design context of the neighborhood. A small, useable public park is provided at the corner of Ravens Rock Road and Carmanhall Road. The existing mature trees are to be retained and protected in order to create a green pocket along the street, that can be enjoyed by both the public and residents of the proposed development. Green roofs and screened private landscaped roof terrace are provided on most of the buildings to create and provide very private and sunny amenity spaces and gardens for the residents. A green, communal open space courtyard, pocket park and view corridors are provided between the blocks which allow for both the outdoor spaces and the proposed apartments within the scheme to receive ample natural light throughout the day. The central green courtyard provides a useable communal open space with grassy break out spaces for informal play, children's playground, formal seating areas and integrated landscaping, planting, and lighting. According to the Landscape Design Statement[79], the landscape design has been planned in such a way so as to maximise the sites orientation and anticipated micro-climate to create habitable, quality spaces which

[77] Refer to Utilities Report, IN2 Engineering Design Partnership, July 2022.

[78] Refer to Architectural Design Statement, McCauley Daye O'Connell Architects, July 2022.

[79] Refer to Landscape Design Statement, McCauley Daye O'Connell Architects, July 2022.

Policy Objective	Description	Proposed Development Considerations
		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. In addition, it is anticipated that the development will offer a net gain to biodiversity through the development of additional habitat. The primary objectives of the design are to encourage biodiversity through varied tree and shrub planting. Sustainable urban drainage systems have been employed in the design of the scheme for rainwater management. All roofs in the development have been designed as green/ blue roofs to reduce storm water runoff and increase biodiversity. It is also proposed to incorporate bio-retention tree pits and rain gardens. An increased number of trees, areas for surface water treatment and wildflower meadows, coupled with best practice maintenance will ensure a sustainable landscape for the future.
CA19: Community Woodlands	It is a policy objective to promote and support Community Woodland Schemes in line with government policy.	The public spaces provided within the scheme enhance the urban design context of the neighborhood. A small, useable public park is provided at the corner of Ravens Rock Road and Carmanhall Road. The existing mature trees are to be retained & protected in order to create a green pocket along the street, that can be enjoyed by both the public and residents of the Proposed Development[80]. The primary objectives of the design are to encourage biodiversity through varied tree and shrub planting[81].

[80] Refer to Architectural Design Statement, McCauley Daye O'Connell Architects, July 2022.

[81] Refer to Landscape Design Statement, McCauley Daye O'Connell Architects, July 2022.

Policy Objective	Description	Proposed Development Considerations
ENVIRONMENTAL INFRASTRUCTURE AND FLOOD RISK		
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.	Regarding residential use of water, it is proposed to use flow restrictors on shower heads and low volume flush mechanisms on cisterns with an aim of restricting water usage to 125 litres per person per day[82].
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.	The foul sewer receiving environment for the Proposed Development consists of the 225mm foul sewer within Arkle Road as required by Irish Water. A pre-connection inquiry was submitted to Irish Water in November 2021 in respect of the foul connection from the Proposed Development. Subsequently, Irish Water has confirmed that based on the size of the Proposed Development and on the capacity currently available, that subject to a valid connection agreement being put in place, the proposed connection to the Irish Water network can be facilitated[83].
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. The existing drainage system is a separate foul and surface water drainage system and the existing site drains to the separate foul and surface water public sewers on Carmanhall Road.
EI6: Sustainable Drainage Systems	It is a Policy Objective to ensure that all development proposals incorporate Sustainable Drainage Systems (SuDS).	The proposed surface water drainage system for this development has been designed as a SuDS system and uses permeable paving, filter strips and green roofs/podium, below ground attenuation together with flow control devices and petrol interceptor to treat run-off and remove pollutants to improve quality, restrict outflow and control quantity[84].

[82] Refer to Energy Analysis Report, IN2 Engineering Design Partnership, July 2022, Section 3.2.

[83] Refer to Engineering Assessment Report, Waterman Moylan Consulting Engineers Limited, June 2022.

[84] Refer to Engineering Assessment Report, Waterman Moylan Consulting Engineers Limited, June 2022.

Policy Objective	Description	Proposed Development Considerations
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.	A Stage 1 Stormwater Audit has been carried out in accordance with the Dún Laoghaire-Rathdown County Council (DLRCC) procedures. The auditor has examined issues within the design relating to surface water drainage implications of the scheme. The findings of this audit provide recommended actions in order to improve the stormwater credentials of the scheme[85]. An Engineering Assessment Report has been prepared for the Proposed Development which details all drainage strategies and associated impacts. This report describes the criteria used to design the storm water discharge, disposal of foul water, and water supply[86]. A surcharge analysis of the surface water drainage system has also been conducted and is discussed within the Site-Specific Flood Risk Assessment (SSFRA)[87]. The risk of flooding as a result of drainage system surcharging is mitigated by providing attenuation for the development which can store water for the 1 in 100-year storm event plus a 20% allowance for climate change and therefore the residual risk is low. The surface water drainage from the Proposed Development will be attenuated on site and will have a restricted outflow to the public surface water sewer, reducing the rate of run-off to the sewer and further reducing the risk of the sewer surcharging. Therefore, the likelihood of flooding due to surcharging the existing drainage network is considered low.
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	A Stage 1 Stormwater Audit has been carried out in accordance with the Dún Laoghaire-Rathdown County Council (DLRCC) procedures. The auditor has examined issues within the design relating to surface water drainage implications of the scheme. The findings of this audit provide

[85] Refer to Stage 1 Storm Water Audit, PUNCH Consulting Engineers, June 2022.

[86] Refer to Engineering Assessment Report, Waterman Moylan Consulting Engineers Limited, June 2022.

[87] Refer to Site Specific Flood Risk Assessment Report, Waterman Moylan Consulting Engineers Limited, July 2022.

Policy Objective	Description	Proposed Development Considerations
	these intermittent discharges to ensure that the needs of the Region's receiving waters are met in a cost-effective manner.	recommended actions in order to 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].
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 SSFRA[90] has been prepared for the Proposed Development which has assessed the susceptibility of the Site to pluvial, fluvial, and tidal flooding. Flooding from groundwater and human/mechanical error has also been assessed. The subject site has been analysed for risks from flooding from the Irish Sea / Dublin Bay, the Carysfort Maretimo Stream, the internal and external surface water network, ground water and failures of mechanical systems. Through site location, careful design, and appropriate mitigation measures, the risks and consequences of flooding have been mitigated across the development.

[88] Refer to Stage 1 Storm Water Audit, PUNCH Consulting Engineers, June 2022.

[89] Refer to Operational Waste Management Plan, AWN Consulting, July 2022.

[90] Refer to Site Specific Flood Risk Assessment Report, Waterman Moylan Consulting Engineers Limited, July 2022.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusion

To conclude, the Proposed Strategic Housing Development at the 'Former Avid Technology site', at the junction of Blackthorn Road and Carmanhall Road Sandyford, Dublin 18 is considered to have met the criteria set out by the Taxonomy Regulation, in regard to being classed as an environmentally sustainable economic activity, such that it has:

- Made a substantive contribution to one of six environmental objectives, in this case Climate Change Adaptation;

- Demonstrated that no significant harm will be made to the remaining five EU Taxonomy environmental objectives.

- Has met minimum safeguards (as set out by the relevant legislation).

- Has demonstrated compliance with the technical screening criteria as set out within the Supplementing Regulation, through the preparation of a Climate Risk and Vulnerability Assessment, which has incorporated the following:

    - State of the art climate projections (EPA & 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 dually 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.

Furthermore, this Report has provided information to support the Board 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.

7.2 Recommendations

7.2.1 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.

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.

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 the PV / solar thermal array and centralised group heating systems is carried out periodically and completed in accordance with good practice.

- Inspection and maintenance of the drainage systems is carried out periodically and completed in accordance with good practice. This will ensure that the drainage systems are capable of managing storm runoff during periods of exceptionally high rainfall.

- 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. However, to account for a worst-case scenario (should such drainage measures fail), it is recommended to conduct a risk assessment, as necessary, when deciding the future location and placement of critical infrastructure. Low level and basement areas should be avoided to prevent potential impacts from pluvial flood events.

- Install rainwater harvesting facilities, which would allow for the reuse of water in irrigation of the landscaping.

- In relation to the increase in windstorms, there is currently uncertainty in the projected change of this climate hazard. Therefore, it is recommended to reassess this climate hazard and its potential risk to buildings should projections in future climate indicate a significant increase in windstorms for this location.

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

These recommended additional measures have been presented to Atlas GP Limited who have accepted them and committed to implementing them.

7.2.2 Do No Significant Harm (DNSH)

DNSH criteria have been addressed and incorporated into the Proposed Development design. In order to further ensure compliance with these criteria, the following measures are recommended:

- Auditing of the Construction Phase to ensure that environmental management controls are being implemented to prevent pollution;

- Auditing of the Construction Phase to ensure that environmental management controls are being implemented to avoid adverse ecological impacts;

- Auditing of the Construction Phase to ensure that waste management objectives and recycling targets are being fulfilled;

- Auditing of waste management operations during the Operational Phase to ensure maximum recycling, reuse and recovery of waste with diversion from landfill, wherever possible.

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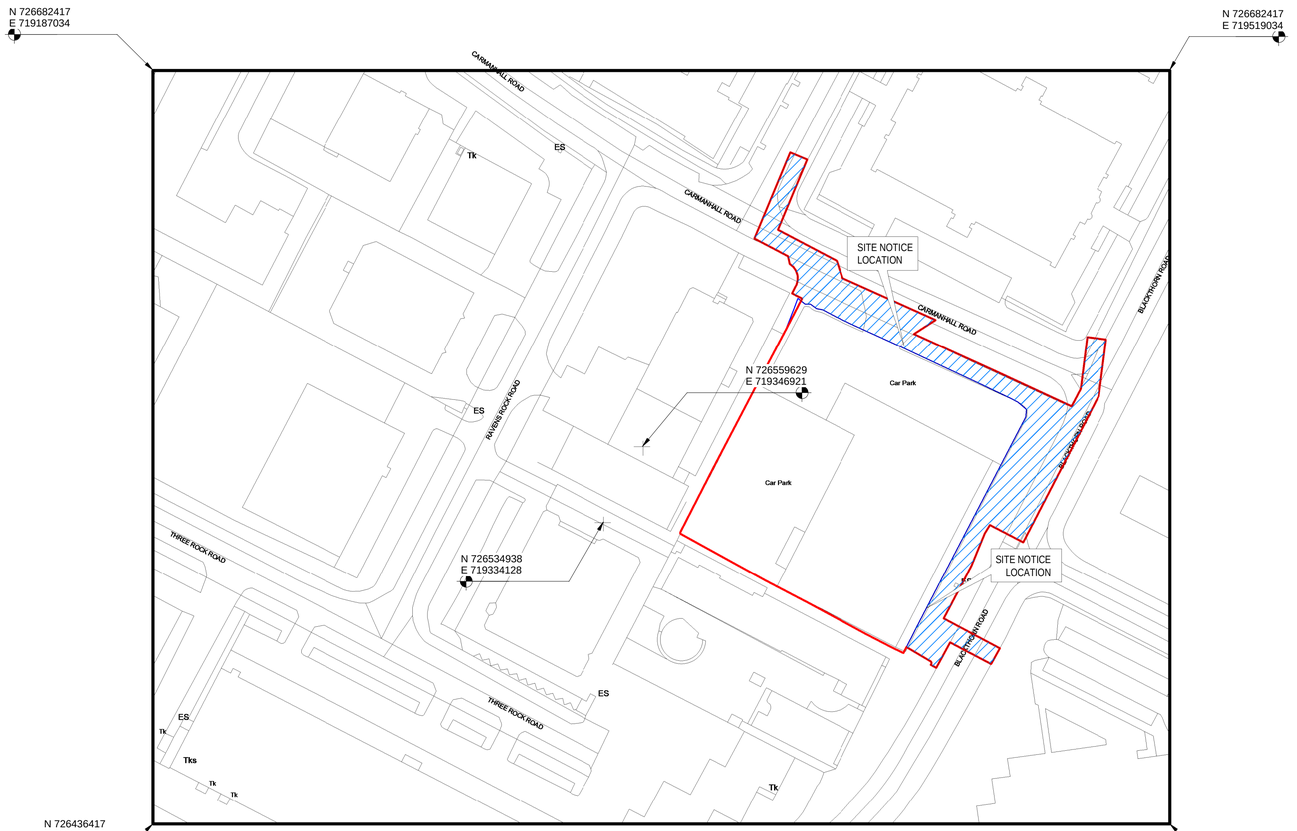
Appendix 1

Site Location and Site Layout

A1



1 SITE LOCATION MAP - AVID SITE

1 : 1000

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Map Series | Map Sheets
1:1,000 | 3392-25
1:1,000 | 3392-20

Data Extraction Date:
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Date= 11-Sep-2020

Source Data Release:
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DCLMS Release V1.131.110

Product Version:
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Version= 1.3

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PLANNING

REV	DATE	DESCRIPTION	BY
1	05/11/2021	S247	AT
2	15/12/2021	SHD1	AT
3	27/04/2021	SHD2	AT
4	22/08/2022	SHD3	RT

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SITE LEGEND

SITE BOUNDARY

LEGAL INTEREST BOUNDARY

DLRCC LAND = 2598 m2

NORTH POINT

ONLY FOR REFERENCE WITH PLAN DRAWINGS

APPROVED BY

19/08/2022 11:49:33

Client: ATLAS GP LIMITED

Project: CARMANHALL ROAD SHD 2022

Title: SITE LOCATION PLAN - AVID SITE

Sheet No.: 1081-MDO-AS-XX-DR-A-01002A

Scale as: As indicated @ A1 Current Rev.: 4 Project No.: 1081

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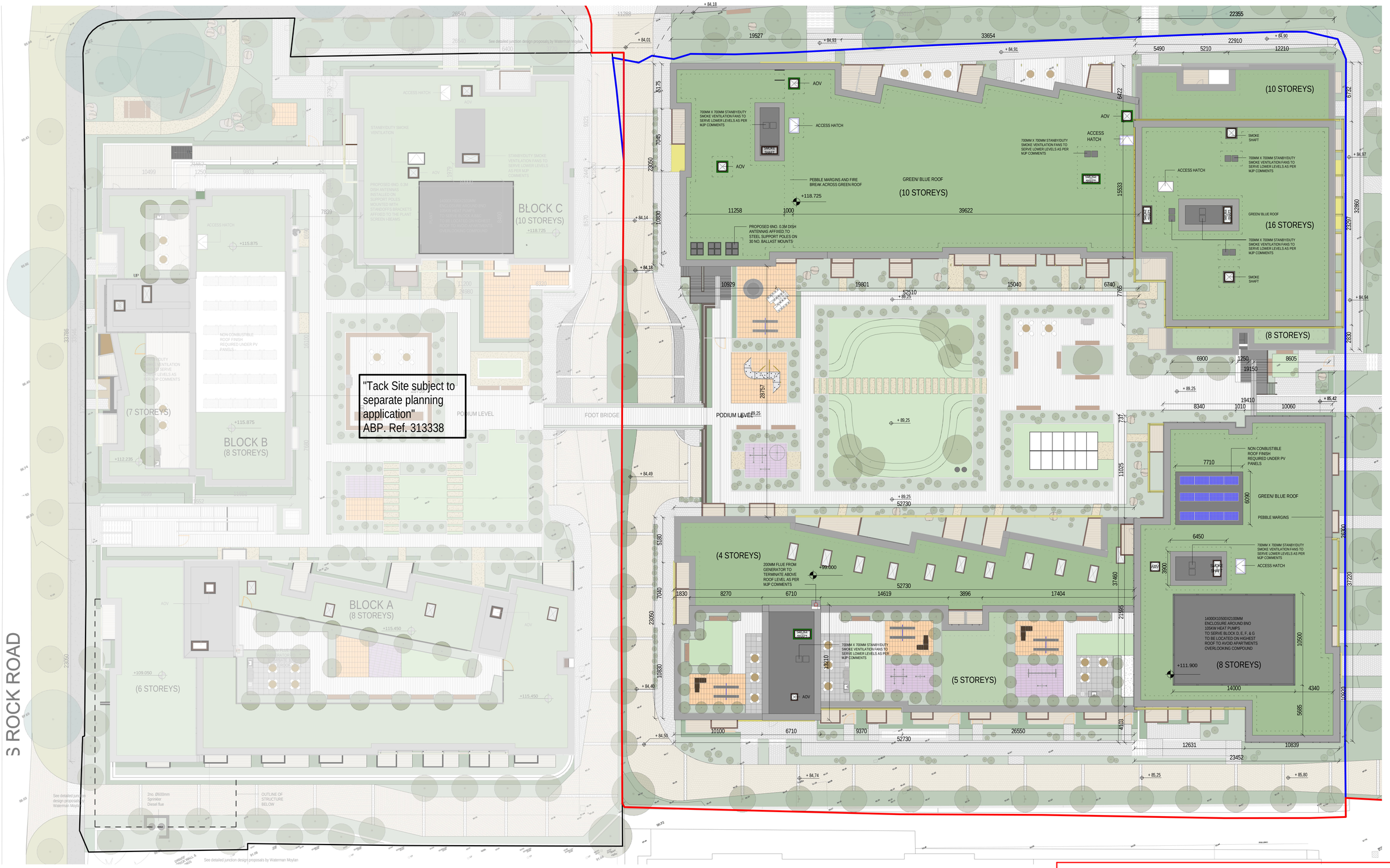

1 SITE PLAN - 1 200 - AVID & TACK SITE
Scale: 1 : 200

PLANNING

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2	15/12/2021	SHD1	AT
3	27/04/2021	SHD2	AT
4	22/08/2022	SHD3	RT

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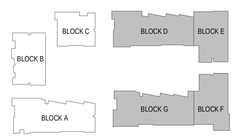
SITE LEGEND

SITE BOUNDARY = 0.9908 ha

LEGAL INTEREST BOUNDARY = 0.7310 ha



NORTH POINT

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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 3

Appendix B (generic criteria for DNSH to sustainable use and protection of water and marine resources) from Annex II of Commission Delegated Regulation (EU) 2021/2139.

APPENDIX B: GENERIC CRITERIA FOR DNSH TO SUSTAINABLE USE AND PROTECTION OF WATER AND MARINE RESOURCES

Environmental degradation risks related to preserving water quality and avoiding water stress are identified and addressed with the aim of achieving good water status and good ecological potential as defined in Article 2, points (22) and (23), of Regulation (EU) 2020/852, in accordance with Directive 2000/60/EC[670] and a water use and protection management plan, developed thereunder for the potentially affected water body or bodies, in consultation with relevant stakeholders. Where an Environmental Impact Assessment is carried out in accordance with Directive 2011/92/EU and includes an assessment of the impact on water in accordance with Directive 2000/60/EC, no additional assessment of impact on water is required, provided the risks identified have been addressed.

[670] For activities in third countries, in accordance with applicable national law or international standards which pursue equivalent objectives of good water status and good ecological potential, through equivalent procedural and substantive rules, i.e. a water use and protection management plan developed in consultation with relevant stakeholders which ensures that 1) the impact of the activities on the identified status or ecological potential of potentially affected water body or bodies is assessed and 2) deterioration or prevention of good status/ecological potential is avoided or, where this is not possible, 3) justified by the lack of better environmental alternatives which are not disproportionately costly/technically unfeasible, and all practicable steps are taken to mitigate the adverse impact on the status of the body of water.

Appendix 4

Appendix C (generic criteria for DNSH to pollution prevention and control regarding use and presence of chemicals) from Annex II of Commission Delegated Regulation (EU) 2021/2139.

APPENDIX C: GENERIC CRITERIA FOR DNSH TO POLLUTION PREVENTION AND CONTROL REGARDING USE AND PRESENCE OF CHEMICALS

The activity does not lead to the manufacture, placing on the market or use of:

(a) substances, whether on their own, in mixtures or in articles, listed in Annexes I or II to Regulation (EU) 2019/1021, except in the case of substances present as an unintentional trace contaminant;

(b) mercury and mercury compounds, their mixtures and mercury-added products as defined in Article 2 of Regulation (EU) 2017/852;

(c) substances, whether on their own, in mixture or in articles, listed in Annex I or II to Regulation (EC) No 1005/2009;

(d) substances, whether on their own, in mixtures or in an articles, listed in Annex II to Directive 2011/65/EU, except where there is full compliance with Article 4(1) of that Directive;

(e) substances, whether on their own, in mixtures or in an article, listed in Annex XVII to Regulation (EC) 1907/2006, except where there is full compliance with the conditions specified in that Annex;

(f) substances, whether on their own, in mixtures or in an article, meeting the criteria laid down in Article 57 of Regulation (EC) 1907/2006 and identified in accordance with Article 59(1) of that Regulation, except where their use has been proven to be essential for the society;

(g) other substances, whether on their own, in mixtures or in an article, that meet the criteria laid down in Article 57 of Regulation (EC) 1907/2006, except where their use has been proven to be essential for the society.

Appendix 5

Appendix D (Generic Criteria for DNSH to Protection and Restoration of Biodiversity and Ecosystems) from Annex II of Commission Delegated Regulation (EU) 2021/2139.

APPENDIX D: GENERIC CRITERIA FOR DNSH TO PROTECTION AND RESTORATION OF BIODIVERSITY AND ECOSYSTEMS

An Environmental Impact Assessment (EIA) or screening[671] has been completed in accordance with Directive 2011/92/EU[672].
Where an EIA has been carried out, the required mitigation and compensation measures for protecting the environment are implemented.
For sites/operations located in or near biodiversity-sensitive areas (including the Natura 2000 network of protected areas, UNESCO World Heritage sites and Key Biodiversity Areas, as well as other protected areas), an appropriate assessment[673], where applicable, has been conducted and based on its conclusions the necessary mitigation measures[674] are implemented.

671 The procedure through which the competent authority determines whether projects listed in Annex II to Directive 2011/92/EU is to be made subject to an environmental impact assessment (as referred to in Article 4(2) of that Directive).

672 For activities in third countries, in accordance with equivalent applicable national law or international standards requiring the completion of an EIA or screening, for example, IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks.

673 In accordance with Directives 2009/147/EC and 92/43/EEC. For activities located in third countries, in accordance with equivalent applicable national law or international standards, that aim at the conservation of natural habitats, wild fauna and wild flora, and that require to carry out (1) a screening procedure to determine whether, for a given activity, an appropriate assessment of the possible impacts on protected habitats and species is needed; (2) such an appropriate assessment where the screening determines that it is needed, for example IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.

674 Those measures have been identified to ensure that the project, plan or activity will not have any significant effects on the conservation objectives of the protected area.