



Flood Risk Assessment

Cherry Orchard Point – Phase 3 of Proposed Development at
Sites 4 and 5, Park West Avenue, Dublin 10

September 2026

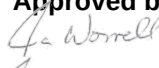
Waterman Moylan Consulting Engineers Limited

Block S, East Point Business Park, Alfie Byrne Road, Dublin D03 H3F4
www.waterman-moylan.ie

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Issue	Date	Prepared by	Checked by	Approved by
No. 1	15 September 2026	C Maher	P Ingle	
No. 2	17 September 2026	P. Ingle	I. Worrell	

Comments

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1. Introduction

This Flood Risk Assessment has been prepared by Waterman Moylan as part of the planning documentation for the proposed Phase 3 development at Cherry Orchard Point Sites 4 and 5, Park West Avenue, Dublin 10.

This Flood Risk Assessment has been carried out in accordance with the *DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management* published in November 2009. This assessment identifies the risk of flooding at the site from various sources and sets out possible mitigation measures against the potential risks of flooding. Sources of possible flooding include coastal, fluvial, pluvial (direct heavy rain), groundwater, and human/mechanical errors. This report provides an assessment of the subject site for flood risk purposes only.

This report has further been prepared in accordance with, or cognisant of as appropriate, with the following documents:

- Ordnance Survey Mapping
- Dublin City Council Development Plan (2022-2028).
- Park West & Cherry Orchard LAP.
- Ground investigation details as per the Site Investigation Report.
- Site Specific Topographic Survey.
- Greater Dublin Strategic Drainage Study.
- Green Roofs Over Dublin: A Green Roof Policy Guidance Paper for Dublin.
- Greater Dublin Regional Code of Practice for Drainage Works.
- OPW Guidelines.
- OPW flood maps.
- Department of Environment Flooding Guidelines.
- Geological Survey of Ireland maps.
- Dublin City Council's Climate Action Plan 2019-2024.
- Strategic Flood Risk Assessment Guidelines.
- OPW Vulnerability Classifications Guidelines.
- OPW National Flood Hazard Maps.
- Dublin City Council's Surface Water Management Plan.

The objective of this site-specific Flood Risk Assessment is to assess all types of flood risk to a development. The assessment investigates potential sources of flood risk and includes for the effects of climate change. The assessment examines the impact of the development and the effectiveness of flood mitigation and management procedures proposed. It should also present the residual risks that remain after those measures are put in place. This approach is based on the identification of flood zones for river and coastal flooding. "Flood Zones" are geographical areas used to identify areas at various levels of flood risk. It should be noted that these do not consider the presence of flood defences, as the risks remain of overtopping and breach of the defences.

2. Masterplan Lands

2.1 Cherry Orchard Point Site Location and Description

The subject masterplan development is comprised of two sites. Site 4 & Site 5 are bisected by Park West Avenue and lie to the west and east of this roadway respectively. Site 4 is shown as per the blue shaded area of the masterplan development indicated on Figure 2-1: Site Location Map (Source: Google Maps). The proposed Phase 3 subject site is located within Site 5: Barnville of the masterplan development, which is shown within the redline boundary in the below figure. Site 5 is accessed via a secured gate from Cedar Brook Way.

The proposed Phase 3 development is bound by Park West Avenue to the west, the realigned Cedar Brook Way (completed under the Approved Phase 1 development with ref. ABP-318607-23 which is currently under construction) to the north, Cherry Orchard Green (previously Barnville Park) to the east, and Barnville Park, residential dwellings, and the Dublin-Kildare Rail Line to the south.

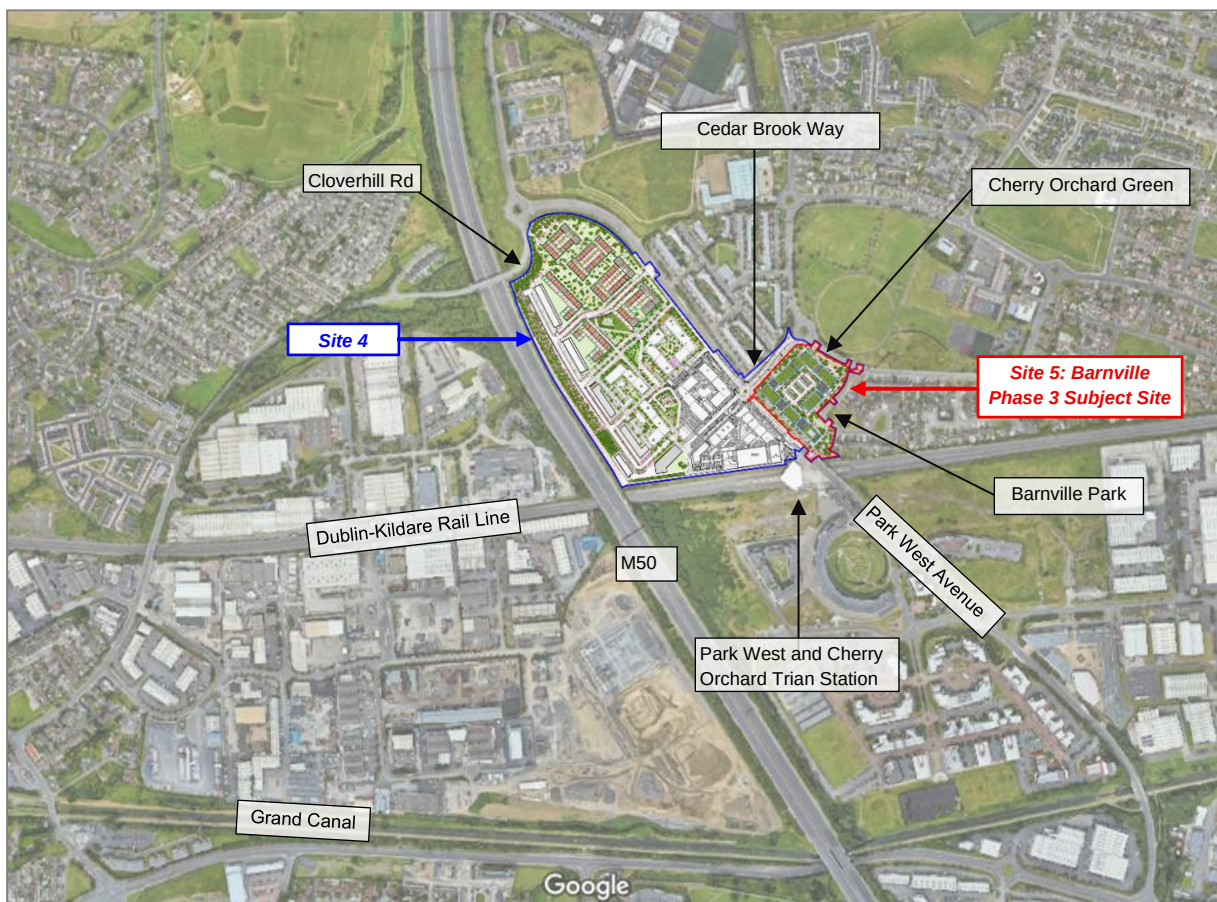


Figure 2-1: Site Location Map (Source: Google Maps)

The overall masterplan development area as per the blue line boundaries is c. 14.24 ha, with Site 5 being c. 1.72 ha. The area of the subject application indicated by the redline boundary in the above figure, including for works in the public domain, is 1.72 ha.

2.2 Indicative Phasing

The indicative phasing of the 4-phase masterplan development is illustrated in Figure 2-2: Indicative Masterplan Development Phasing Layout, below.

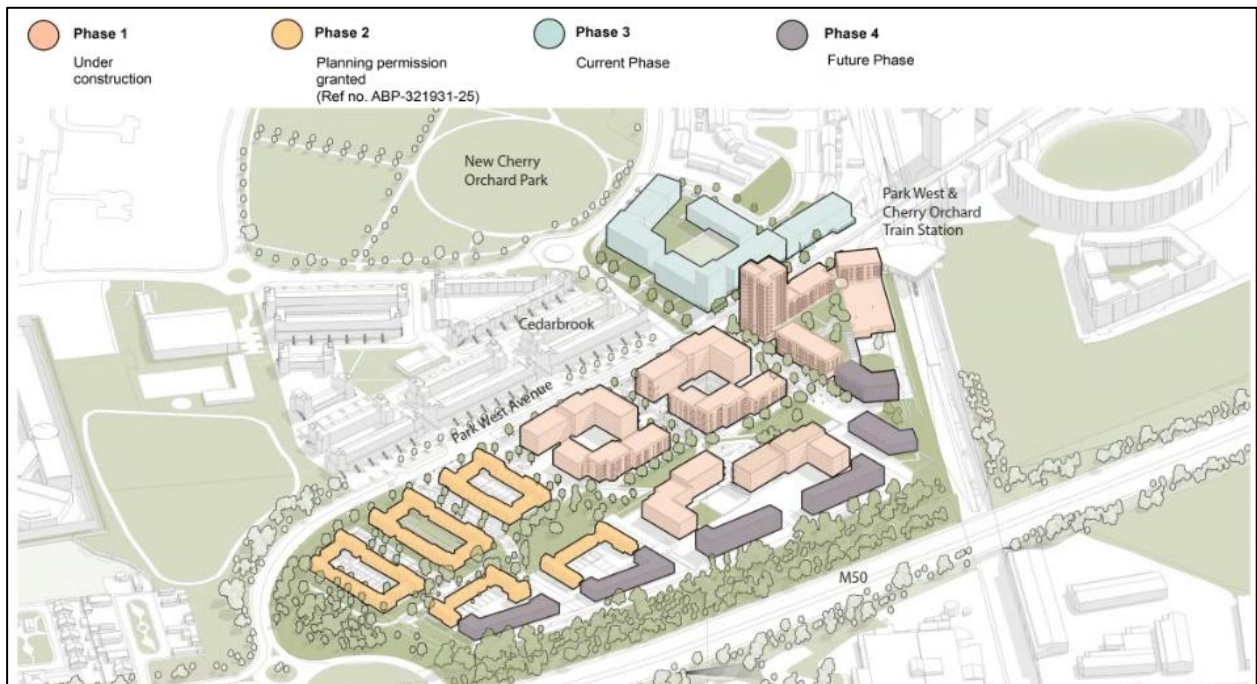


Figure 2-2: Indicative Masterplan Development Phasing Layout

2.3 Proposed Masterplan Development

A description of each of the 4-Phases is included below:

Approved Phase 1 (Under Construction)

Is a medium and high-density area located on Site 4 which will provide a total of 708 no. residential units ranging in size from studio to 3-bed apartments, a 2,523m² supermarket, a combined area of 373m² for retail over 7 units, a 672m² creche and 1,222m² of community spaces over 13 buildings. It is noted that the trunk foul and surface water drainage, including attenuation storage, to serve phases 2, 3, & 4 are part-provided under the planning application submission for Phase 1.

Phase 1 of Cherry Orchard Point was approved in July 2024 under ABP Ref. 318607-23 and is currently under construction.

Approved Phase 2 (Under Construction)

Is a low-density housing area located to the north of Site 4 and is proposed to contain 137 no. residential units comprising a mix of apartment/duplex units and houses.

Phase 2 of Cherry Orchard Point was granted planning permission in September 2025 under ABP Ref. 321931-25 and had recently commenced construction at the time of writing this report.

Phase 3 (Subject Site)

The subject development, Cherry Orchard Point - Phase 3, is located on Site 5, and comprises 312 residential units, local retail and commercial units, and landscaped public and communal open space.

The subject development, Cherry Orchard Point – Phase 3 will be referred to as the “proposed Phase 3 development” or “subject site” within this report.

Proposed Phase 4 (Future Development)

Phase 4 of the masterplan lands is located along the western edge of Site 4 and will consist of the construction of commercial office space over 6 blocks.

2.4 Topographical Details

The Phase 3 subject site is located within Site 5 of the masterplan development (refer to Figure 2-1).

The latest Site Investigation Report undertaken by Ground Investigations Ireland (GII) in August of 2024, included as an appendix to the Preliminary Construction Environmental Management Plan submitted under a separate cover, has determined that Site 5 is predominantly a brownfield site, with fill material found.

For Site 4, the topographic survey of the area indicates that the low point of the site has a level of 55.70m OD. This is located on the eastern site boundary approximately 140m north of the junction of Park West Avenue and Cedar Brook Way. The remainder of the site generally slopes to this location owing to the embankments and subsequent site grading from the Dublin-Kildare Rail line to the south, M50 to the west, and approach road to the overpass on the M50 to the north. A local high point of the site has a level of 62.65m OD located at the northeast of Site 4.

Site 5 has a central high point with a level of 58.04m OD in the centre of the site and isolated high points at the southwest of the site. Generally, the site slopes from the centre outwards to all boundaries. The boundaries of Site 5 typically have levels between 54.55m and 60.78m, with the highest of these levels being located at the southwest of Site 5, adjacent to the retaining wall of the Park West Avenue Bridge over the rail lines.

Refer to Figure 2-3: Existing Site Topography of the Subject Site Lands for an extract of the topographical survey of the development showing spot elevations throughout Sites 4 and 5.



Figure 2-3: Existing Site Topography of the Subject Site Lands

3. Proposed Development

3.1 Development Description

The proposed development will consist of the construction of a residential led mixed-use scheme containing 312no. residential apartments comprising 244no. cost rental and 68no. social units, 8no. local retail and commercial units, landscaped public and communal open space. The proposed development includes a new principal access via Barnville Park to the south, providing entry to an internal undercroft parking court, upgraded pedestrian and cycle footpaths, Barnville link connecting the Park West Avenue and Cherry Orchard railway station and all associated site and public realm works. The proposed development represents Phase 3 of the overall planned development at Cherry Orchard Pointe for Development Sites 4 and 5 of the LAP lands. Phase 1 of the overall planned development was granted permission in July 2024 (ACP Case Ref: 318607-23) and Phase 2 was granted in September 2025 (ACP Ref. 31-395-2025). The proposed development comprises the works to be undertaken on Site 5: Barnville, which forms the subject of this planning application.

The proposed development (Total GFA c. 28,413 sq.m) involves construction of 312no. residential apartments (c. 24,556 sq.m), across 7 blocks consisting of 4 to 10 floors, comprising 16no. studio units, 146no. one-bed units, 139no. two-bed units (15no. two-bed three-person and 124no. two-bed four person), 9no. 3-bed units (three four-person) and 2no. 4-bed units (one four-bed seven-person) together with 8no. Local Retail and Commercial units (c. 1,441 sq.m GFA), and all ancillary and sundry accommodation (c. 2,416sq.m total GFA). The proposed development also includes the provision of landscaped public open space of 1691 sq.m and 6519sq.m of communal open space. The communal open space has been designed to provide a high-quality amenity area, incorporating a community garden seating and play areas and fitness facilities, and associated landscaping. The scheme also provides private open space for all residential units.

The proposed development will involve the provision of car parking (including accessible and EV car parking spaces), car sharing spaces, bicycle parking spaces, motorbike spaces, motorcycle parking spaces, and loading bays. The scheme includes a Barnville link to the south of the site connecting Barnville Park with Park West Avenue and providing direct pedestrian access to the railway station, along with over 40no. pedestrian crossing points connecting Park West Avenue, Barnville Park and New Cherry Orchard Park.

The development will also provide for all associated ancillary site development infrastructure including site clearance, boundary treatment, associated public lighting, internal roads and pathways, substations, switch room, water tank rooms, storage room, rainwater/surface water attenuation, stormwater, bin storage, bicycle stores, hard and soft landscaping, play equipment, boundary walls, attenuation area, green and blue roof systems, photovoltaic panels and all associated works and infrastructure to facilitate the development including connection to foul and surface water drainage and water supply.

Refer to the enclosed statutory notices for a full description of development as part of this planning application.

3.2 Site Investigation Details and Infiltration Rates

3.2.1 Barnville Park Site Investigation

A site investigation for Site 5 was commissioned by Dublin City Council and undertaken by Ground Investigations Ireland (GII) in January of 2018. The report details are included below:

- Ground Investigations Ireland Barnville Park Cherry Orchard Ground Investigation Report Revision A (issued 29 January 2018)

The scope of the works undertaken in the 2018 Site Investigation Report included trial pits, soakaways, cable percussion boreholes, geotechnical and environmental laboratory testing, and a report with recommendations.

The Site Investigation Report is submitted as part of this application as an appendix to the Preliminary Construction Environmental Management Plan.

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An extract of the test location site map included under Appendix 1 of the Site Investigation Report is included in Figure 3-1: Barnville Park Site Investigation Test Locations, below. The map has been modified to include annotations at each test location including information related to the existing ground level, made ground level (MGL), made ground depth (MGD), topsoil level (TSL), and topsoil depth (TSD) taken from the test results found under Appendix 2 of the Report.

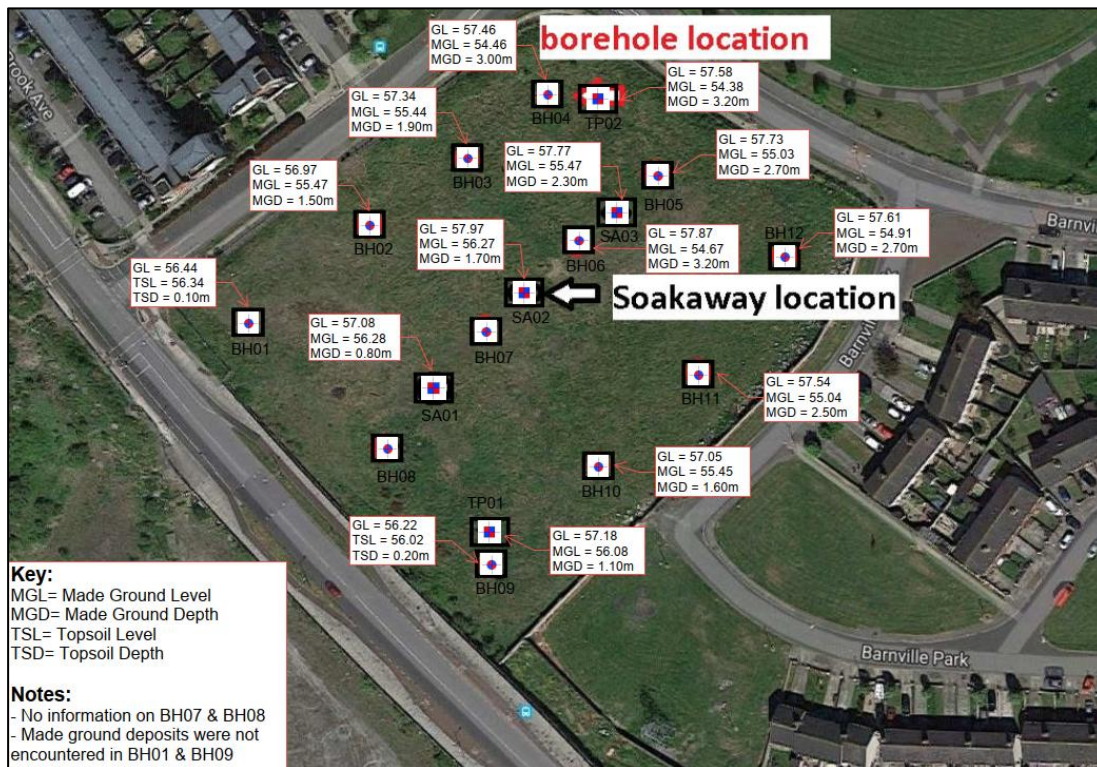


Figure 3-1: Barnville Park Site Investigation Test Locations and Annotations

Report findings – Soil Infiltration Results

Under *Chapter 5.0 Recommendations & Conclusions* of the Report, the following is stated regarding the soakaway testing:

“At the locations of SA01, SA02 and SA03 the water level dropped too slowly to allow calculation of the soil infiltration rate. These locations are therefore not recommended as suitable for soakaway design and construction.”

No groundwater was noted during the investigation.

3.2.2 Cherry Orchard Site 4 and 5 Phase 2 Site Investigation

As part of the Approved Phase 2 Development (ABP Ref. 321931-25), site investigations for the masterplan lands (including Site 5) were undertaken in August of 2024 by Ground Investigations Ireland (GII). Two reports were issued by GII, the details of which are included below:

- Ground Investigations Ireland Cherry Orchard Site 4 and 5 Phase 2 Ground Investigation Report Revision C (issued 28 August 2024)
- Ground Investigations Ireland Cherry Orchard Site 4 and 5 Phase 2 Waste Classification Report Revision B (issued 22 August 2024)

These Site Investigation Reports are submitted as part of this application as an appendix to the Preliminary Construction Environmental Management Plan.

The scope of the works undertaken in the 2024 Site Investigation Report included trial pits, soakaways, slit trenches, window sample boreholes, cable percussion boreholes, rotary core boreholes, geotechnical and environmental laboratory testing, and a report with recommendations.

An extract of the test location site map included under Appendix 1 of the Site Investigation Report (and for which shows the location of the tests undertaken on the proposed Phase 3 development) is included in Figure 3-2: Cherry Orchard Site 4 and 5 Site Investigation Test Locations, below.

The map shows that no soakaway testing was undertaken on Site 5 as part of this investigation.



Figure 3-2: Cherry Orchard Site 4 and 5 Site Investigation Test Locations

Report findings – Soil Infiltration Results

5-no. soakaway tests were however undertaken on the Site 4 lands to the west and recorded the following regarding the infiltration rate of Site 4:

“At the locations of SA A, SA B, SA C, SA D, and SA E the water level dropped too slowly to allow calculation of ‘f’ the soil infiltration rate. These locations are therefore not recommended as suitable for soakaway design and construction.”

3.2.3 Cherry Orchard Site 5 Phase 3 Site Investigation

As part of the Proposed Phase 3 development further Site investigation was undertaken by GII in August 2026 at the Site 5: Barnville subject site and is submitted as part of this application as an appendix to the Preliminary Construction Environmental Management Plan. The test locations within the subject site are shown in the figure below.



Figure 3-3: 2026 Cherry Orchard Site 5: Barnville Site Investigation Test Locations

Report findings – Soil Infiltration Results

A total of four soakaway tests were undertaken with the area outlined in the above figure. The soakaway tests undertaken are in-line with those of the previous site investigations discussed above.

At all soakaway locations, the water level dropped too slowly to allow calculation of 'f' the soil infiltration rate. The soil infiltration rates on site are not recommended as suitable for soakaway designs.

3.2.4 Site Investigations Soil Infiltration Rate Conclusion

It can be concluded from the above Site Investigation Reports that the Masterplan Lands (Sites 4 and 5) do not contain soils that provide adequate infiltration rates for surface water management features relying solely on infiltration. However, localised infiltration within Sustainable Urban Drainage Systems (SuDS) can be incorporated into the design where features such as engineered rain gardens, swales, or bioretention tree pits are designed with appropriate overflow mechanisms and positive drainage connections to the main surface water network.

4. Flood Risk

4.1 Introduction

The flood risk assessment of a development should be carried out in accordance with the Planning System and Flood Risk Management Guidelines for Planning Authorities (2009), published by the Department of Environment, Heritage and Local Government in conjunction with the Office of Public Works (EHLG/OPW). This document will be referred to as the 'Guidelines (EHLG/OPW)' in this report.

The types of possible flooding to be considered in the identification and assessment of flood risk are described in Chapter 2 of the Guidelines (EHLG/OPW) and are summarised below:

- Coastal – flooding from higher sea levels than normal
- Fluvial – flooding from watercourses
- Pluvial – flooding from heavy rainfall/surface water
- Ground Water – flooding from springs / raised groundwater
- Human/mechanical error – flooding due to human or mechanical error

Each type will be investigated from a Source, Pathway and Receptor perspective, followed by an assessment of the likelihood of a flood occurring, and the possible consequences. An illustration of this model can be seen in Figure 4-1, taken directly from the Guidelines (EHLF/OPW).

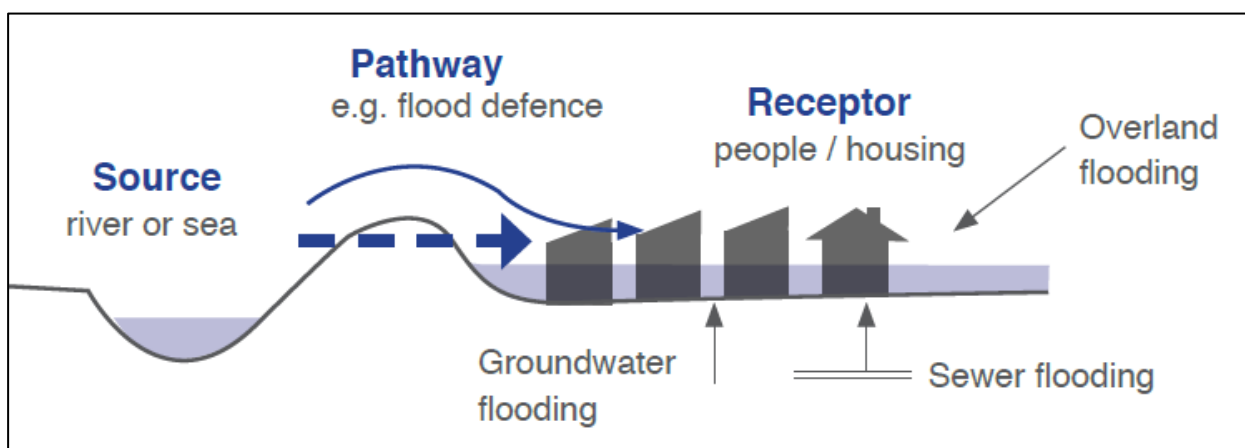


Figure 4-1: Source-Pathway-Receptor S-P-R Model

A flood risk assessment combines these above components and maps or describes the risks on a spatial scale so that the consequences can then be analysed.

The likelihood and the consequences of flooding (overall risk) fall into three categories; low, moderate and high, as described in the Guidelines (EHLF/OPW) and set out in Table 4-1.

The aim of a flood risk assessment is to establish the risk of flooding for a subject site, this can be assessed using two components, summarised below:

$$\text{Flood Risk} = \text{Likelihood of flooding} \times \text{Consequences of flooding}$$

4.1.1 Assessing Likelihood

The likelihood of flooding falls into the categories of low, moderate and high, which are described in the Guidelines (EHLF/OPW) as follows:

Table 4-1: Guidelines for Assessing Likelihood

LIKELIHOOD	LOW	MODERATE	HIGH
Coastal	Probability < 0.1%	0.5% > probability > 0.1%	Probability > 0.5%
Fluvial	Probability < 0.1%	1.0% > probability > 0.1%	Probability > 1.0%
Pluvial	Probability < 0.1%	1.0% > probability > 0.1%	Probability > 1.0%

Note: Probability denotes the likelihood of occurrence in a given year.

For groundwater flooding and flooding from human/mechanical error, the limits of probability are not defined and therefore professional judgement is used. However, the likelihood of flooding is still categorised as low, moderate and high for these components.

4.1.2 Assessing Consequence

There is no defined method used to quantify a value for the consequences of a flooding event. Therefore, in order to determine a value for the consequences of a flooding event, the elements likely to be adversely affected by such flooding will be assessed, with the likely damage being stated, and professional judgement will be used to determine a value for consequences. Consequences will also be categorized as low, moderate, and high.

4.1.3 Assessing Risk

Based on the determined 'likelihood' and 'consequences' values of a flood event and the above equation of Flood Risk = Likelihood of flooding X Consequences of flooding, the 3x3 Risk Matrix seen in Table 4-2 will then be used to determine the overall risk of a flood event.

Table 4-2: 3x3 Risk Matrix

		CONSEQUENCES		
		LOW	MODERATE	HIGH
LIKELIHOOD	LOW	Extremely Low Risk	Low Risk	Moderate Risk
	MODERATE	Low Risk	Moderate Risk	High Risk
	HIGH	Moderate Risk	High Risk	Extremely High Risk

4.2 Flood Zones

Flood zones are used to identify the likelihood, and therefore vulnerability, of flooding in a particular area. The zones are geographical areas with associated ranges of the likelihood of flooding and are essential in the creation of flood risk management plans. According to the Guidelines (DEHLG/OPW) flood zones can be categorised into 3 types or levels of flood zones, namely:

Table 4-3: Flood Zone Types according to the Guidelines (DEHLF/OPW)

Type	Description	Probability of flooding
Zone A	Where the probability of flooding from rivers and the sea is <u>highest</u>	Greater than 1% (1:100 year) for fluvial flooding, or greater than 0.5% (1:200 year) for coastal flooding
Zone B	Where the probability of flooding from rivers and the sea is <u>moderate</u>	Between 0.1% (1:1000 year) & 1% (1:100 year) for fluvial flooding, and 0.1% (1:1000 year) & 0.5% (1:200 year) for coastal flooding
Zone C	Where the probability of flooding from rivers and the sea is <u>low</u>	Less than 0.1% (1:1000 year) for both fluvial and coastal flooding

Flood zone maps are used to establish the level of flooding for a site, an example of this can be seen in the indicative map shown in Figure 4-2.



Figure 4-2: Indicative flood zone map extract from the Guidelines (DEHLF/OPW)

4.3 Sequential Approach and Justification Test

4.3.1 Sequential Approach

A sequential approach to planning is a vital tool in ensuring that development, particularly new development, is first and foremost directed towards the land that is at low risk of flooding. Sequential approaches are already established and working effectively in other areas in the plan-making and development management processes. The sequential approach principles are described in Figure 4-3, taken from the Guidelines (DEHLF/OPW). The sequential approach should be applied to all stages of the planning and development management process, particularly the planning stage. The mechanism for use of the sequential approach can be seen in Figure 4-4.

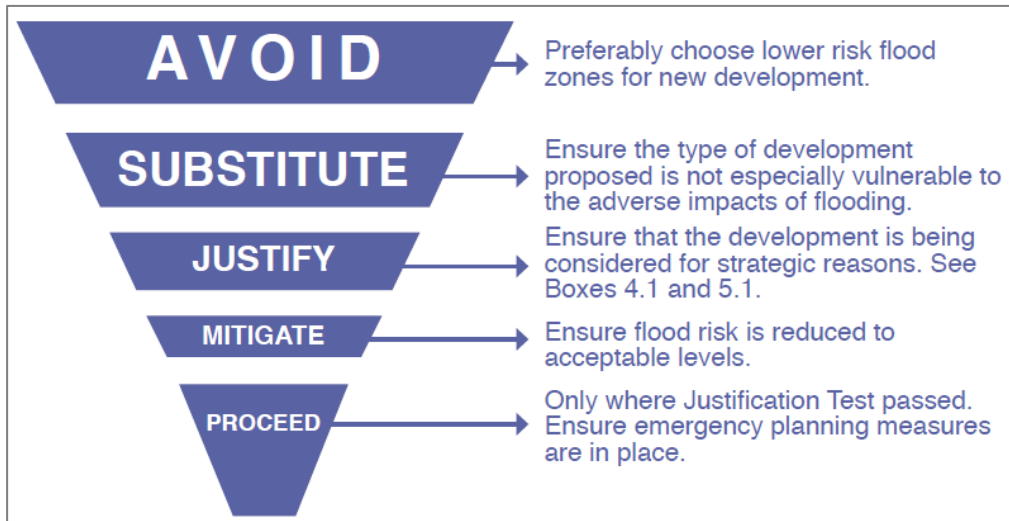


Figure 4-3: Sequential Approach Principles in Flood Risk Management

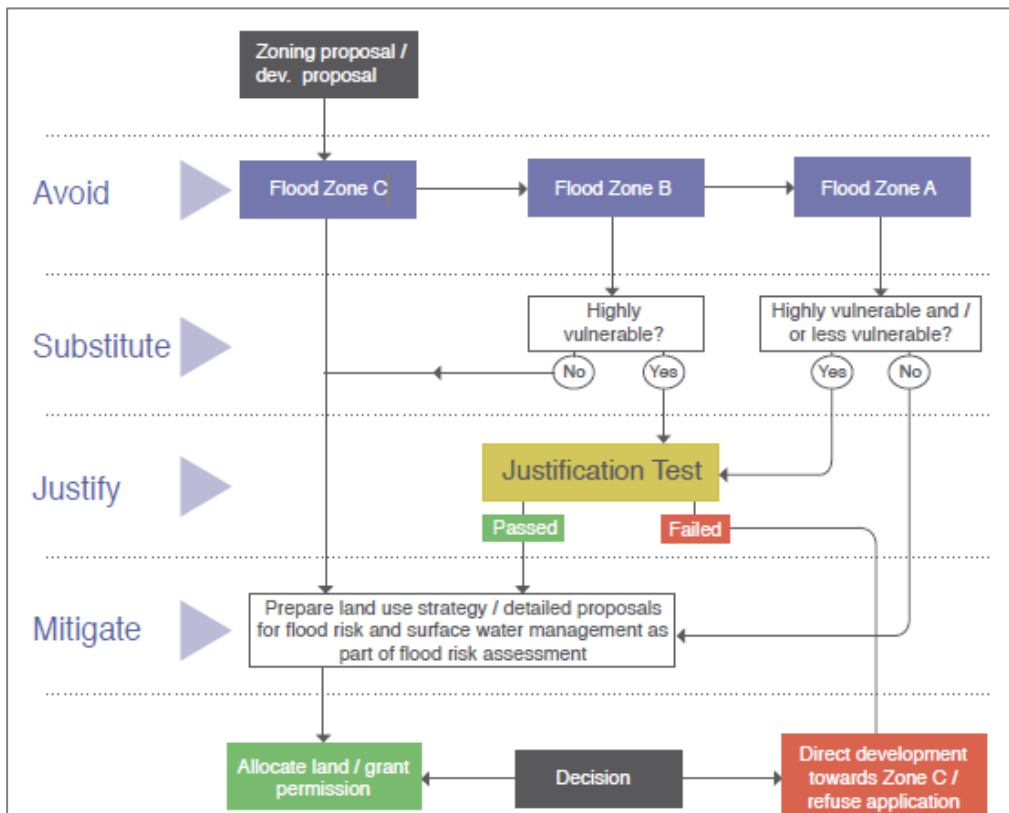


Figure 4-4: Sequential Approach Mechanisms

If the subject site does not fall within the 'Avoid' or 'Substitute' tiers of the sequential approach principle, a Justification test is required.

4.3.2 Justification Test

A matrix of vulnerability versus flood zone clearly outlines which types of development require a Justification Test. The vulnerability of a site is categorized into 3 levels, highly vulnerable, less vulnerable, and water compatible. Figure 4-5 taken from the Guidelines (DEHLG/OPW) illustrates these categories.

Vulnerability class	Land uses and types of development which include*:
Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).
*Uses not listed here should be considered on their own merits	

Figure 4-5: Vulnerability Classes

The resulting matrix of vulnerability vs. flood zone, taken from the Guidelines (DEHLG/OPW), illustrates which type of developments require a Justification Test, and can be seen below.

- **The Subject Site's Vulnerability Class**

As this subject site falls within the 'Highly-vulnerable development' category according to Figure 4-5, when assessing the matrix vs. vulnerability of the development – with a Flood Zone C development – it is considered to be an “appropriate” development and therefor does not require a Justification Test be completed. Refer to Table 4-4 for the matrix of vulnerability vs. flood zone relevant to the subject site.

Table 4-4: Matrix of vulnerability vs. flood zone - Justification Test

Type	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water compatible development	Appropriate	Appropriate	Appropriate

Thus, it is considered an appropriate development and **does not require a Justification Test** or further flood mitigation measures other than what is described in this report.

Details pertaining to the Flood Zone of the subject site, Flood Zone C, is discussed in detail in the sections to follow within this report.

5. Coastal Flooding – Irish Sea

5.1 Source

Coastal flooding occurs when normally dry, low-lying land is flooded by seawater. The extent of coastal flooding is a function of the elevation inland flood waters penetrate, which is controlled by the topography of the coastal land exposed to flooding.

5.2 Pathway

The site is approximately 13.1km southwest of the nearest coastline at Dublin Bay. The Dublin Coastal Protection Project indicated that the 2002 high tide event reached 2.95m OD Malin. The lowest proposed finished floor level at the Phase 3 development is to be constructed at 54.70m OD Malin, well above the historic high tide event.

The Office of Public Works provides flood mapping on their website floodinfo.ie. An extract of the coastal flood mapping is shown below in Figure 5-1: Extract from Coastal Flood Extent Mapping (Source: floodinfo.ie). The map extract indicates that the nearest extent of coastal flooding is located at Islandbridge on the River Liffey, c. 4.7km east from the subject site.

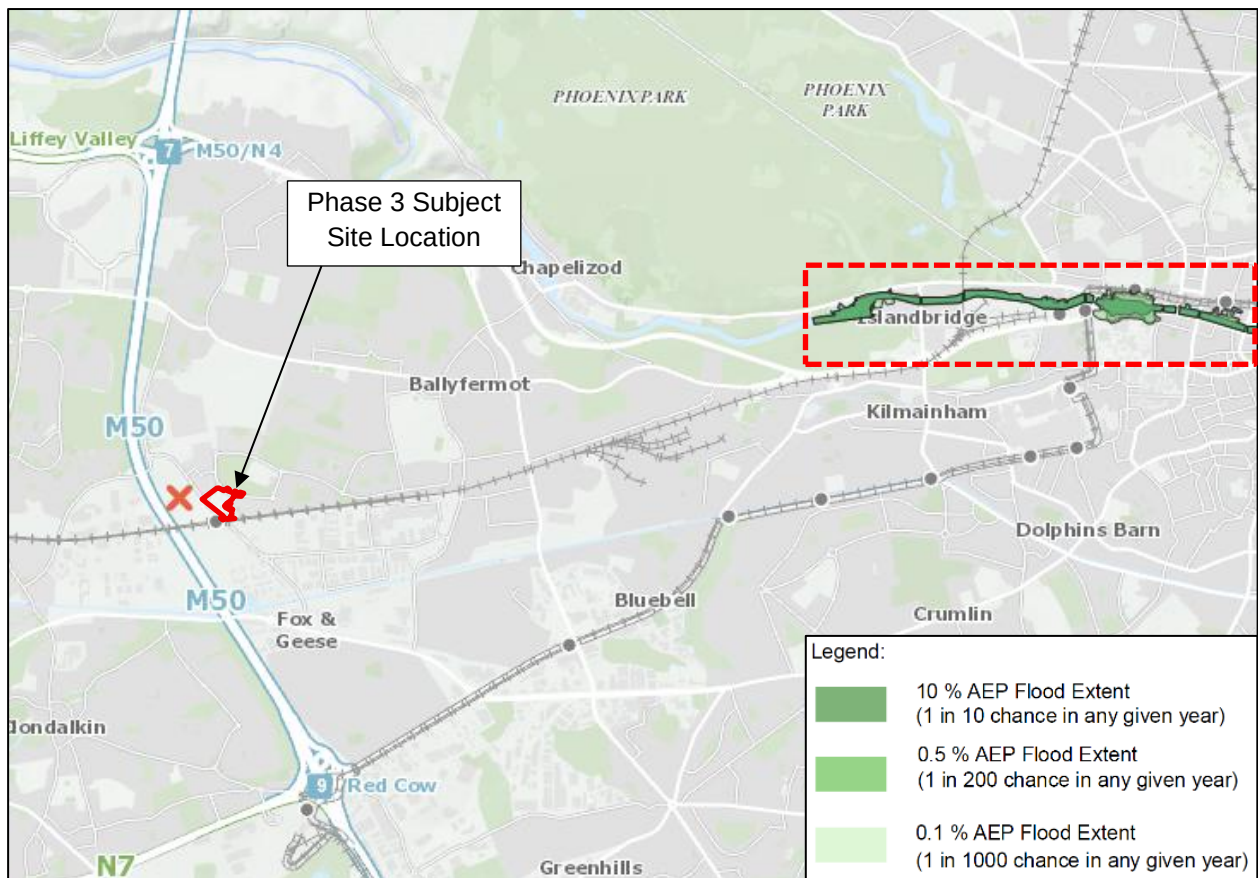


Figure 5-1: Extract from Coastal Flood Extent Mapping (Source: floodinfo.ie)

High probability flood events, as shown in the above map, are defined as having approximately a 1-in-10 chance of occurring or being exceeded in any given year (10% Annual Exceedance Probability), medium

probability flood events are defined as having an AEP of 0.5% (1-in-200 year storm), while low probability events are defined having an AEP of 0.1% (1-in-1,000 year storm). The map indicates that the subject development is not at risk of flooding for the 1 in 1,000-year event.

Given that the site is located c.13.1 kilometres inland from the Irish Sea, c.4.7 kilometres from the nearest location at risk of coastal flooding, that there is at least a 51.75m level difference between the lowest proposed building floor level (54.70m) and the record high tide event, and given that the site is outside of the 1-in-1,000 year flood plain, it is evident that a pathway does not exist between the source and the receptor. The risk from coastal flooding is therefore extremely low and no flood mitigation measures need to be implemented.

5.3 Likelihood

As no practical pathway for coastal flooding to the subject site exists, there is negligible likelihood of flooding from coastal sources.

5.4 Consequence

The consequence of possible coastal flooding of the subject site would include flooding of open green spaces areas and internal roads/parking areas, however with no viable pathway for flooding and negligible likelihood, this is inconsequential.

5.5 Risk

There is a negligible risk of coastal flooding.

5.6 Flood Risk Management

No flood risk management measures are required for a negligible risk of coastal flooding.

6. Fluvial Flooding

6.1 Source

Fluvial flooding occurs when a water course / river's flow exceeds its capacity, typically following excessive rainfall, though it can also result from other causes such as heavy snow melt and ice jams.

6.2 Pathway

The subject site is located within the Blackditch Stream catchment. The Blackditch stream is a tributary of the Camac River which outfalls to the River Liffey at Heuston Station. There are no direct hydrological links (surface water drainage systems or natural watercourses) between the subject sites and the Blackditch stream. There is potential for indirect hydrological connectivity whereby during heavy rainfall events, surface water runs overground to the surface water gullies in the adjacent road networks.

Similar to the coastal map discussed in the previous section, Figure 6-1: Extract from Fluvial Flood Extent Mapping (Source: floodinfo.ie) below, shows an extract of the extent of potential fluvial flooding in the vicinity of the site. This extract indicated that the site is not at risk of flooding for even the 1 in 1,000-year flood event.

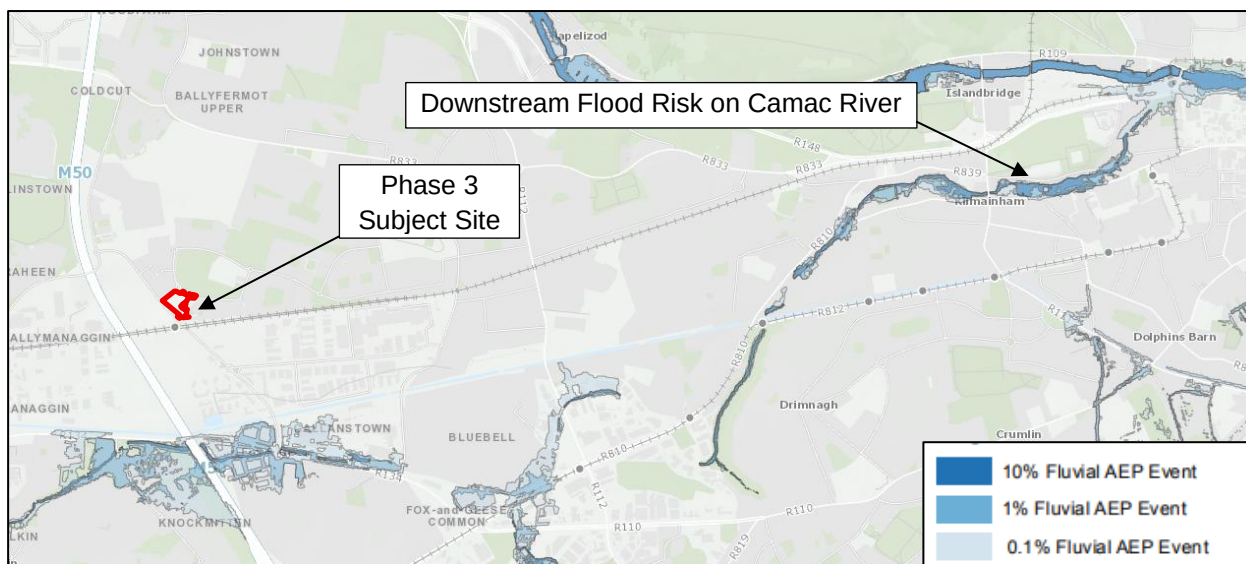


Figure 6-1: Extract from Fluvial Flood Extent Mapping (Source: floodinfo.ie)

The above figure indicates the potential for fluvial flooding to the south of the site across the grand canal on the Camac River. A closer study of the fluvial flood map ref: e09cam_exfcd_f1_17, an extract of which is included as Figure 6-2: Extract from Flood Map: e09cam_exfcd_f1_17 below, as retrieved from the OPW website, shows the relevant flood node points along the flood route of the Camac River.

The nearest flood node point to the site has a corresponding node reference of 09CAMM007501. The tabulated data for this node point informs that the water level of the 0.1% AEP (1 in 1,000-year storm), is predicted to be 51.08m OD. This is 3.62m below the lowest proposed finished floor level on the subject site (54.70m). In addition, the node point is located almost a kilometre (c. 975m) south of the Phase 3 Subject Site.

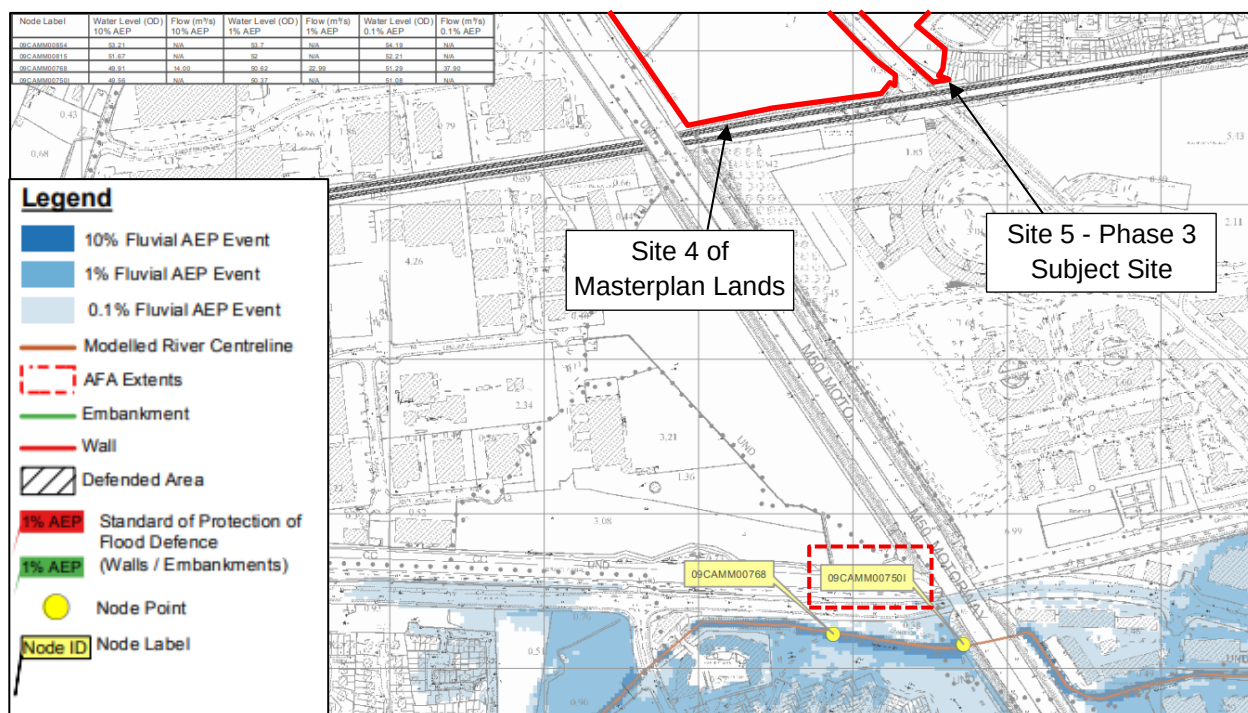


Figure 6-2: Extract from Flood Map: e09cam_exfcd_f1_17

6.3 Likelihood

As the potential pathway is c. 975m in length and the difference in elevation between the potential flood node and the lowest FFL of the subject site is 3.62m, the likelihood for fluvial flooding to the subject site is considered to be low.

6.4 Consequence

The consequence of possible fluvial flooding of the subject site would include flooding of open green spaces areas and internal roads/parking areas, this consequence is considered to be low.

6.5 Risk

There is an extremely low risk of fluvial flooding.

6.6 Flood Risk Management

No flood risk management measures are required for an extremely low risk of fluvial flooding.

7. Pluvial

7.1 Source

Pluvial flooding occurs when heavy rainfall creates a flood event independent of an overflowing water body. Pluvial flooding can happen in any urban area, including higher elevation areas that lie above coastal and river floodplains.

7.2 Pathway & Receptors

During periods of extreme prolonged rainfall, pluvial flooding may occur through the following pathways:

Table 7-1: Pathways and Receptors

	Pathway	Receptor
1	Surcharging of the proposed internal drainage systems during heavy rain events leading to internal flooding	Proposed development – properties and roads
2	Surcharging from the existing surrounding drainage system leading to flooding within the subject site by surcharging surface water pipes	Proposed development – properties and roads
3	Surface water discharging from the subject site to the existing drainage network leading to downstream flooding	Downstream properties and roads
4	Overland flooding from surrounding areas flowing onto the subject site	Proposed development – properties and roads
5	Overland flooding from the subject site flowing onto surrounding areas	Downstream properties and roads

7.3 Likelihood

The likelihood of each of the 5 pathway types are addressed individually as follows:

7.3.1 Surcharging of the proposed on-site drainage systems leading to internal flooding

The surface water drainage design has been undertaken in accordance with the Greater Dublin Strategic Drainage Study (GDSDS), which recommends a 20% climate change allowance for the 1-in-100-year rainfall event. However, according to the Environmental Engineers within the Design Team for the Proposed Phase 3 development, more recent climate projections for Ireland, including outputs derived from CMIP5-based datasets (e.g. TRANSLATE, 2023), indicate potential increases in extreme short-duration rainfall events in the order of approximately 26% to 40% over the mid- to late-century period.

In this context, and in line with a precautionary approach to climate resilience, an increased climate change allowance to a total of 30% has been considered within the assessment. This uplift is intended to provide additional robustness in accounting for uncertainty in future rainfall intensity and to ensure the long-term performance of the drainage infrastructure under projected climate conditions.

Therefore, the proposed on-site surface water drainage network and associated SuDS features have been designed to accommodate the 1-in-100-year rainfall event, including a 30% allowance for climate change.

Provided the drainage network is adequately maintained, surcharging of the proposed on-site system is considered unlikely.

Accordingly, the likelihood of surcharging within the on-site surface water drainage system is considered to be low.

7.3.2 Surcharging from the existing surrounding drainage system leading to internal flooding

The OPW website provides details of historic flood events. Figure 7-1: Extract from Historic Flood Event Map (Source: floodinfo.ie), shows an extract of the historic flood events map within the vicinity of the site. Recorded flood events in the vicinity of the site are in the location of the identified flood plains on the Camac River, south of the Grand Canal as noted earlier under the fluvial flood risk section.

These historical flood areas are not considered a risk to the subject site or proposed development.



Figure 7-1: Extract from Historic Flood Event Map (Source: floodinfo.ie)

7.3.3 Surface water discharge from the subject site leading to downstream flooding

Due to the increase in hard standing area as a result of the proposed development, there is an increased likelihood of surface water discharge from the site leading to downstream flooding if no flood mitigation measures are incorporated into the design.

To address this, the proposed Phase 3 development has been designed to ensure the 1-in-100-year flood event plus 30% allowance for climate change can be accommodated within the site through the use of nature-based SuDS solutions whilst also maintaining the restricted outflow rate as required by Dublin City Council (2ℓ/s/ha).

The restricted outflow rate will ensure surface water is discharged at the allowable rate and no downstream flooding is caused by the proposed Phase 3 development. The likelihood of surface water discharge from the subject site leading to downstream flooding is thus considered to be low.

7.3.4 Overland flooding from surrounding areas leading to internal flooding

Overland flooding from the surrounding areas would include surcharging off existing surface water networks and extreme pluvial rainfall events overflowing into the proposed development.

The proposed building blocks with external access from the public roads and proposed public footpaths are designed with a minimum finished floor level of 55.00m OD Malin. The highest adjacent road level to these blocks is also in the order of 55.00m OD Malin. The proposed development will design parking spaces with permeable paving sloping in towards the blocks thereby collection surface water runoff from the public roads.

The proposed undercroft parking area between the building blocks is set at a finished level of 54.70 m OD Malin, approximately 300mm below the adjacent carriageway level on Barnville Park. The risk of surface water entering the undercroft is mitigated through the provision of a raised access ramp at the entrance, which also functions as a raised pedestrian crossing. This creates a positive threshold that prevents overland runoff from the adjoining roadway entering the undercroft.

In addition, surface water gullies are provided within the undercroft parking area to collect any runoff generated internally and convey it to the proposed surface water drainage network.

7.3.5 Overland flooding from the subject site leading to flooding in surrounding areas

Considering the extensive blue green roof systems at roof and podium level proposed for the development, permeable paving proposed at all external parking bays, and further SuDS features proposed around the external façade of the building (rain gardens and bio-retention areas), the likelihood of overland flooding from the subject site leading to flooding in surrounding areas is considered to be low. All surface water drainage will be designed to limit the discharge rates to 2 ℓ/s/ha.

7.4 Consequence

Surface water flooding would result in flooding of the undercroft parking area and surrounding roads, footpaths, and green space areas. The consequences of pluvial flooding are considered moderate.

7.5 Risk

The risk of each of the 5 pathway types is addressed individually as follows:

7.5.1 Surcharging of the proposed on-site drainage systems leading to internal flooding

With a low likelihood and moderate consequence of flooding the site from surcharging the on-site drainage system, the resultant risk is low.

7.5.2 Surcharging from the existing surrounding drainage system leading to internal flooding

With a low likelihood and moderate consequence of flooding the site from the existing surface water network, the resultant risk is low.

7.5.3 Surface water discharge from the subject site leading to downstream flooding

With a low likelihood and moderate consequence of surface water discharge from the subject site, the resultant risk is low.

7.5.4 Overland flooding from surrounding areas leading to internal flooding

With a low likelihood and moderate consequence of overland flooding from the surrounding areas, the resultant risk is low.

7.5.5 Overland flooding from the subject site leading to flooding in surrounding areas

With a low likelihood and moderate consequence of overland flooding from the subject site, the resultant risk is low.

7.6 Flood Risk Management

As the risk of flooding from the 5 pathways discussed above is considered to be low due to the fact the proposed Phase 3 development is designed to accommodate the 1-in-100-year flood event with 30% climate change allowance and includes a multitude of nature-based SuDS features (including blue green roof systems) no further flood risk management or mitigation measures are required.

8. Groundwater

8.1 Source

Groundwater flooding occurs when the water table rises above the ground surface. This typically happens during periods with prolonged rainfall which exceeds the natural underground drainage system's capacity.

8.2 Pathway

The pathway for groundwater flooding is from the ground. Note that although groundwater flooding is typically considered to be when the water table rises above the ground surface, underground services and foundations could also be affected by high water tables that do not reach the ground surface.

8.3 Receptor

The receptors for ground water flooding would be underground services, roads, the ground floor of the apartment buildings and the undercroft car parking area.

8.4 Likelihood

Groundwater flood maps can be sourced from the Groundwater Flooding Data Viewer supplied by ArcGIS. An extract of the groundwater flood map showing historic flooding and flooding probability for the subject site and surrounding areas is shown in Figure 8-1: Groundwater Flooding Map, below. As can be seen from the map, no flooding from groundwater has been recorded in the area and the flooding probability is also shown as zero (no indication of flooding).

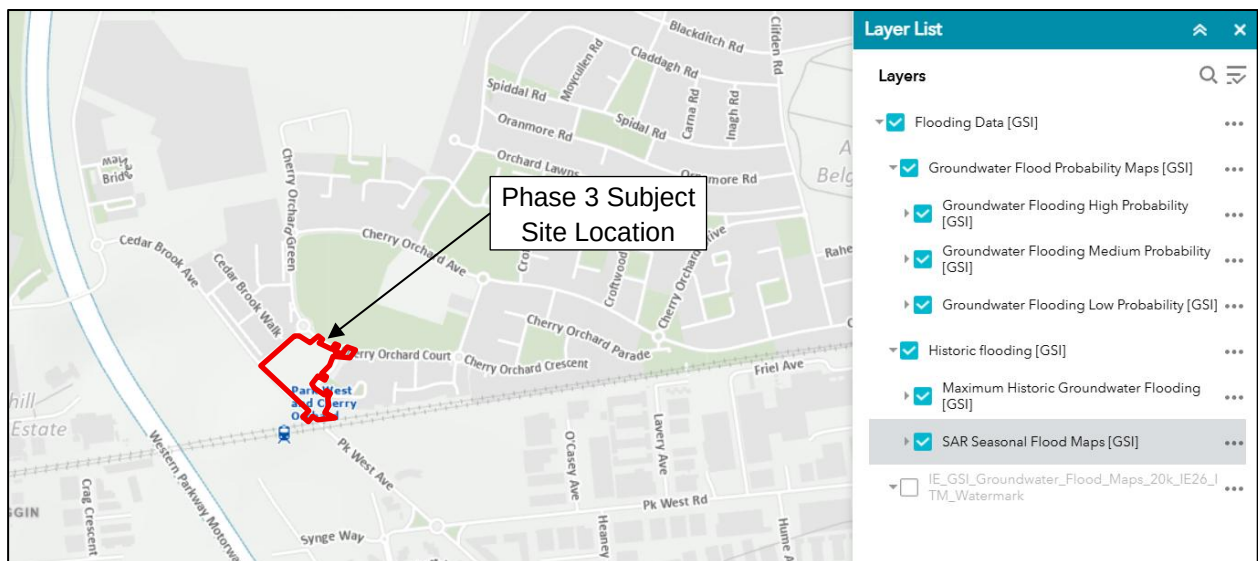


Figure 8-1: Groundwater Flooding Map

The likelihood of flooding from groundwater at the subject site is thus considered to be low.

8.5 Consequence

The consequence of ground water flooding would be some minor temporary seepage of ground water through the ground around the proposed apartment buildings. Underground services could be inundated

from high water tables. Therefore, the consequence of ground water flooding occurring at the proposed development is considered moderate.

8.6 Risk

With a low likelihood and moderate consequences of flooding due to groundwater, the risk is considered low.

8.7 Flood Risk Management

As the risk of groundwater flooding at the subject site is considered low, no further flood risk management or mitigation measures are required.

9. Human/Mechanical Errors

9.1 Source

The subject site will be drained by an internal private storm water drainage system, which will discharge to the public surface water infrastructure.

The internal surface water network is a source of possible flooding were it to become blocked.

9.2 Pathway

If the proposed private drainage system blocks this could lead to possible flooding within the private and public areas.

9.3 Receptor

The receptors for flooding due to human/mechanical error would be the ground floor levels of buildings, the undercroft parking area, the roads, and the open landscaped areas around the site.

9.4 Likelihood

There is a high likelihood of flooding on the subject site if the surface water network were to become blocked.

9.5 Consequence

The surface water network would surcharge and overflow through gullies and manhole lids. It is, therefore, considered that the consequences of such flooding are moderate.

9.6 Risk

With a high likelihood and moderate consequence, there is a high risk of surface water flooding should the surface water network block.

9.7 Flood Risk Management

Finished floor levels have been designed to be above the adjacent road network/access road via Barnville Park, which will reduce the risk of flooding within the undercroft parking area if the surface water network were to block. In the event of the surface water system surcharging, the surface water can still escape from the site by overland flood routing without causing damage to the proposed buildings.

The surface water network (drains, gullies, manholes, AJs, attenuation system) will need to be regularly maintained and where required cleaned out. A suitable maintenance regime of inspection and cleaning should be incorporated into the safety file/maintenance manual for the development.

9.8 Residual Risk

As a result of the flood risk management outlined above, there is a low residual risk of overland flooding from human / mechanical error.

10. Conclusions and Recommendations

The subject lands have been analysed for risks from coastal flooding from the Irish Sea, fluvial and pluvial flooding, ground water, and failures of mechanical systems. Table 10-1: Summary of the Flood Risks from the Various Components below, presents the various residual flood risks involved.

Table 10-1: Summary of the Flood Risks from the Various Components

Source	Pathway	Receptor	Likelihood	Consequence	Risk	Mitigation Measure	Residual Risk
Coastal	<i>Irish Sea (River Liffey)</i>	<i>Proposed development</i>	<i>Extremely low</i>	<i>None</i>	<i>Negligible</i>	<i>None</i>	Negligible
Fluvial	<i>Blackditch Stream & River Camac</i>	<i>Proposed development</i>	<i>Low</i>	<i>Low</i>	<i>Extremely Low</i>	<i>None</i>	Extremely Low
Pluvial	<i>Private & Public Drainage Network</i>	<i>Proposed development, downstream properties, and roads</i>	<i>Ranges from high to low</i>	<i>Moderate</i>	<i>Low</i>	<i>Appropriate SuDS, attenuation design, setting of floor levels, and overland flood routing incorporated into design</i>	Low
Ground Water	<i>Ground</i>	<i>Underground services, areas around units</i>	<i>High</i>	<i>Moderate</i>	<i>Low</i>	<i>None required however appropriate SuDS, attenuation design, setting of floor levels, and overland flood routing incorporated into design</i>	Low
Human/Mechanical Error	<i>Drainage network</i>	<i>Proposed development</i>	<i>High</i>	<i>Moderate</i>	<i>High</i>	<i>Setting of floor levels, overland flood routing, regular inspection of SW network</i>	Low

As indicated in the above table, the various sources of flooding have been reviewed, and the risk of flooding from each source has been assessed. Where necessary, mitigation measures have been proposed. As a result of the proposed mitigation measures, the residual risk of flooding from any source is low.

UK and Ireland Office Locations

