ARUP

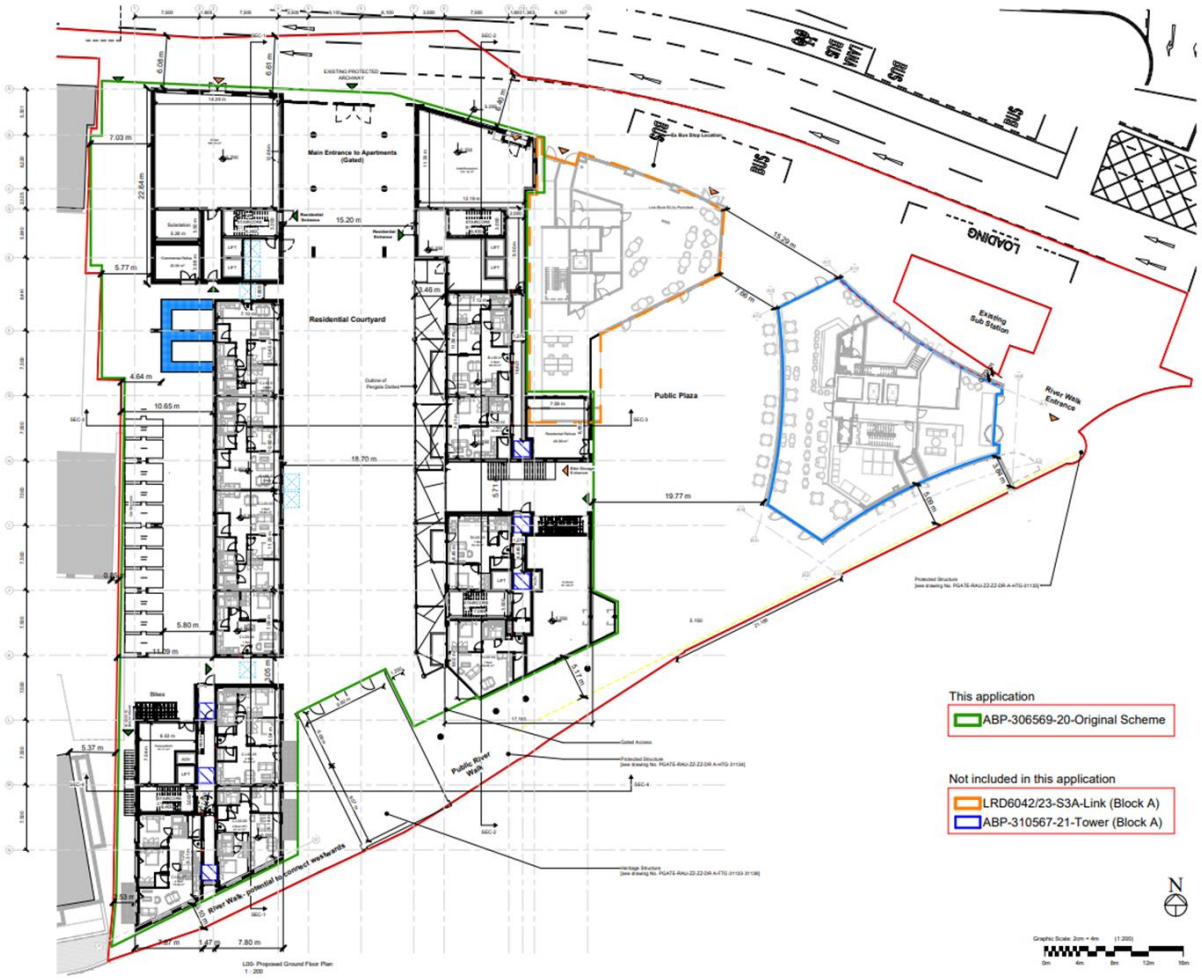
## Ruirside Developments Limited

# Parkgate Street Blocks B1 and C

## Site Specific Flood Risk Assessment

Reference: PGATE-ARUP-ZZ-XX-RP-CF-0002

Issue 2 | 29 November 2024

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Job number 265381-00

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# 1. Introduction

## 1.1 Background

Arup was commissioned by Ruirside Developments Limited to prepare a Site-Specific Food Risk Assessment (FRA) for a proposed mixed-use development on 42A Parkgate Street in Dublin 8 ('the proposed development').

This report details the site-specific FRA which forms part of the planning application for the proposed development. It has been undertaken in accordance with the Guidelines for Planning Authorities on 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' published in November 2009, jointly by the Office for Public Works (OPW) and the then Department of Environment, Heritage and Local Government (DEHLG).

## 1.2 Scope of Work

The scope of the study includes the following:

- Review of all relevant information and data from:
    - The Office of Public Works (OPW) Preliminary Flood Risk Assessment Mapping (PFRA);
    - Eastern Catchment Flood Risk Assessment and Management (CFRAM) Study;
    - The Dublin City Council Development Plan 2022 – 2028;
    - Any historic flood information for the area and/or any relevant studies.
- Review of available site investigation data;
- Review of the risk of coastal, fluvial, pluvial and groundwater flooding; and
- Preparation of an FRA Report.

## 1.3 Summary of Data Used

In preparing this report, the following data was collated and reviewed:

- Eastern Catchment Flood Risk Assessment and Management (CFRAM) report and mapping, produced by the OPW (www.floodinfo.ie);
- Flood history of the site from the OPW National Flood Hazard Mapping website (https://www.floodinfo.ie/map/floodmaps/);
- Site geological and hydrogeological data from the Geological Survey of Ireland website (www.gsi.ie);
- Guidelines for Planning Authorities on 'The Planning System and Flood Risk Management', published in November 2009, jointly by the Office of Public Works (OPW) and the then Department of Environment, Heritage and Local Government (DEHLG);
- Ground Investigation Report for Hickeys 43 Parkgate Place, completed by Ground Investigations Ireland, July 2019;
- Ground Investigation Report No. 8483, Hickey & Co., Parkgate Street on behalf of Arup IGSL, March 2003;
- Dublin City Development Plan 2022 – 2028 (https://www.dublincity.ie/residential/planning/strategic-planning/dublin-city-development-plan/development-plan-2022-2028); and
- Aerial photography and mapping from Bing Maps and Google Maps.

Note that all Ordnance Datum (OD) levels referred to in this report are to Malin Head Ordnance Datum.

## 1.4 Site Description

The site of the proposed development is located on 42A Parkgate Street, Dublin 8 as indicated in Figure 1. The site is bordered to the north by Parkgate Street, to the south by the River Liffey, to the west by the Parkgate Business Centre and to the east by both the River Liffey and Parkgate Street. The site covers an area of approximately 0.82 hectares and contains a number of low-rise buildings which will be demolished as part of the proposed development. The site also consists of an area of the Parkgate Street roadway which is to be upgraded.

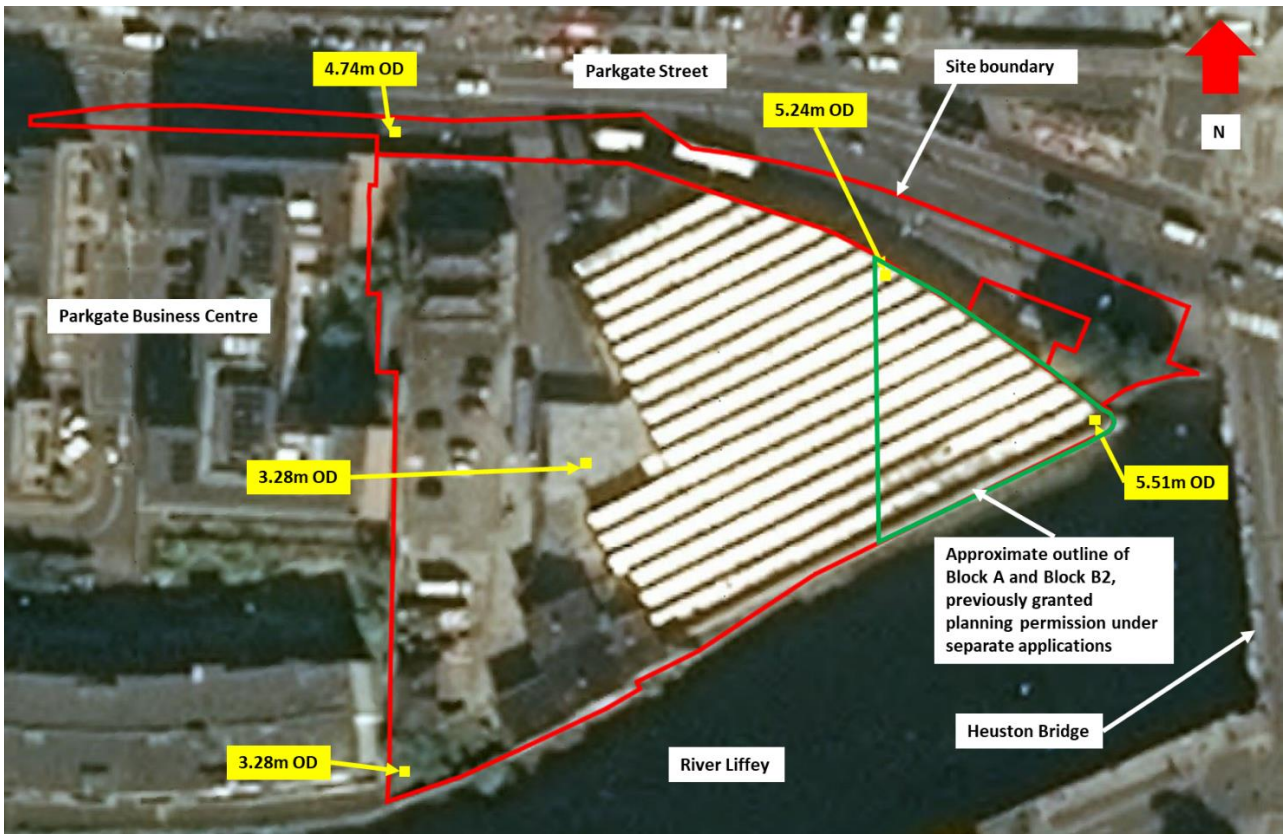


**Figure 1: Site location (source: Bing Maps)**

Existing ground levels across the site vary from approximately 3.30mOD at the southwest boundary to 5.50mOD at the northeast boundary as indicated in Figure 1. Please refer to Appendix A for the detailed topographical survey of the existing site, which was completed by Precision Surveys in July 2018.

## 1.5 Proposed Development

Planning permission was granted in 2020 (ABP Ref. 306569-20) at the site for 321 no. Build-to-Rent (BTR) residential units, ancillary residents' amenity facilities, commercial office space, retail space and café/restaurant accommodated in 5no. blocks ranging from 8 to 13 storeys over ancillary basement area, and all associated and ancillary conservation, landscaping and site development works (with amendments to car parking, basement and undercroft approved by the Board under s.146B (ABP 311507-21 refers). This permission is due to wither in 2025. In the eastern apex of the site, permission was also ultimately granted for a 30-storey Block A tower in 2021 under ABP Ref. 310567-21 which comprises 198 residential units resulting in an overall number of 519 units accommodated on site. A further application for the change of use for Block B2 from commercial office space to 40 number residential units was granted permission in 2023 under DCC Reg. Ref. LRD6042/23. The outline of Block A and Block B2 is approximately shown in green in Figure 1 above.

The planning application, for which this report forms part of, seeks a new permission for Block B1 and Block C ranging in height from 8 to 13 storeys with basement and undercroft, and including: 316no. apartments (178no. 1-bed units and 138no. 2-bed units). These blocks remain largely as per the previously

consented development, with amendments made to comply with Dublin City Council Development Plan 2022-2028. The proposed development, for the purposes of this report, is considered in the context of the application site in its entirety, comprising the proposed development (i.e. revised Blocks B1 & C) and the same associated demolition, conservation, site works, landscape and boundary works, and development previously permitted under 306569-20 (as amended). It is further considered in the context of ABP Ref. 310567-21 as amended by DCC Reg. Ref. LRD6042/23 (Block A and B2). This will collectively be referred to as "the development".

A plan drawing of the ground floor of the proposed development is presented in Figure 2.


**Figure 2: Plan drawing of ground floor of the proposed development (source: Mitchell & Associates)**

# 2. Planning Context

The following planning policy documents are relevant to the assessment of the proposed development:

- The National Planning Guidelines published by the OPW and the Department of the Environment, Heritage and Local Government in November 2009 entitled 'The Planning System and Flood Risk Management Guidelines for Planning Authorities'; and
- The Dublin City Council Development Plan 2022 – 2028.

## 2.1 The Planning System and the Flood Risk Management Guidelines

### 2.1.1 Introduction

In November 2009, the Department of Environment, Heritage and Local Government and the Office of Public Works jointly published a Guidance Document for Planning Authorities entitled 'The Planning System and Flood Risk Management Guidelines for Planning Authorities'.

The Guidelines are issued under Section 28 of the Planning and Development Act 2000. Planning Authorities and An Bord Pleanála are therefore required to implement these Guidelines in carrying out their functions under the Planning Acts.

The aim of the Guidelines is to ensure that flood risk is neither created nor increased by inappropriate development. The Guidelines require the planning system to avoid development in areas at risk of flooding, unless the development can be justified on wider sustainability grounds and the risk can be reduced or managed to an acceptable level.

The Guidelines require the adoption of a Sequential Approach (to Flood Risk Management) of Avoidance, Reduction, Justification and Mitigation and they require the incorporation of Flood Risk Assessment into the process of making decisions on Planning Applications and Planning Appeals.

Fundamental to the Guidelines is the introduction of flood risk zoning and the classifications of different types of development having regard to their vulnerability.

The management of flood risk is now a key element of any development proposal in an area of potential flood risk and should therefore be addressed as early as possible in the site master planning stage.

### 2.1.2 Definition of Flood Zones

Flood Zones are geographical areas within which the likelihood of flooding is in a particular range. There are three types of flood zones defined in the Guidelines, as follows:

**Table 1: Flood zones (source: OPW Guidelines)**

| Flood Zone | Probability |
|---|---|
| Flood Zone A | Probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding). |
| Flood Zone B | Probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 year and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding). |
| Flood Zone C | Probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B. |

### 2.1.3 Definition of Vulnerability Classes

The following table summarises the Vulnerability Classes defined in the Guidelines and provides a sample of the most common type of development applicable to each.

**Table 2: Vulnerability classes (source: OPW Guidelines)**

| Vulnerability | Type of Development |
|---|---|
| Highly Vulnerable Development | Includes Garda, ambulance and fire stations, hospitals, schools, residential dwellings, residential institutions, essential infrastructure, such as primary transport and utilities distribution and SEVESO and IPPC sites, etc. |
| Less Vulnerable Development | Includes retail, leisure, warehousing, commercial, industrial and non-residential institutions, etc. |
| Water Compatible Development | Includes flood control infrastructure, docks, marinas, wharves, navigation facilities, water-based recreation facilities, amenity open spaces and outdoor sport and recreation facilities. |

### 2.1.4 Types of Vulnerability Classes Appropriate to Each Zone

The following table illustrates the different types of Vulnerability Class appropriate to each Zone and indicates where a Justification Test will be required.

**Table 3: Vulnerability classes for each zone (source: OPW Guidelines)**

| Vulnerability Class | Flood Zone A | Flood Zone B | Flood Zone C |
|---|---|---|---|
| Highly Vulnerable | Justification Test | Justification Test | Appropriate |
| Less Vulnerable | Justification Test | Appropriate | Appropriate |
| Water Compatible | Appropriate | Appropriate | Appropriate |

## 2.2 The Dublin City Council Development Plan 2022 – 2028

The Dublin City Development Plan 2022 – 2028 came into effect in December 2022.

The Plan sets out policies and objectives to create a sustainable and vibrant city at the heart of the Greater Dublin Region and is a guide to how and where development will take place in the city over the years covered. The following paragraphs summarise the relevant provisions contained within the Plan which deal with Flood Risk Management.

Section 9.5.3 of the Plan deals with Flood Management and outlines the key policies and objectives of Dublin City Council in relation to flood risk.

The policies are listed as:

- SI13: To minimise the flood risk in Dublin City from all other sources of flooding as far as is practicable, including fluvial, coastal, reservoirs and dams, the piped water system, and potential climate change impacts.
- SI14: To implement and comply fully with the recommendations of the Strategic Flood Risk Assessment prepared as part of the Dublin City Development Plan 2022-2028, including all measures to mitigate identified climate change and flood risks, including those recommended under Part 3 (Specific Flood Risk Assessment) of the Justification Tests, and to have regard to the Flood Risk Management Guidelines (2009), as revised by Circular PL 2/2014, when assessing planning applications and in the preparation of statutory and non-statutory plans.
- SI15: All development proposals shall carry out, to an appropriate level of detail, a Site-Specific Flood Risk Assessment (SSFRA) that shall demonstrate compliance with:
    - The Planning System and Flood Risk Management, Guidelines for Planning Authorities, Department of the Environment, Community and Local Government (2009), as revised by Circular PL 2/2014 and any future amendments, and the Strategic Flood Risk Assessment (SFRA) as prepared by this development plan.
    - The application of the sequential approach, with avoidance of highly and less vulnerable development in areas at risk of flooding as a priority and/ or the provision of water compatible development only. Where the Justification Test for Plan Making and Development Management have been passed, the SSFRA will address all potential sources of flood risk and will consider residual risks including climate change and those associated with existing flood defences. The SSFRA will include sitespecific mitigation measures, flood-resilient design and construction, and any necessary management measures (the SFRA and Appendix B of the above mentioned national guidelines refer). Attention shall be given in the site-specific flood risk assessment to building design and creating a successful interface with the public realm through good design that addresses flood concerns but also maintains appealing functional streetscapes. Allowances for climate change shall be included in the SSFRA.
    - On lands where the Justification Test for Plan Making has been passed and where a small proportion of the land is at significant risk of flooding, the sequential approach to development

will be applied, and development will be limited to Minor Development (Section 5.28 of the Planning System and Flood Risk Management Guidelines 2009) on the portion at significant risk of flooding. There will be a presumption against the granting of permission for highly or less vulnerable development which encroaches onto or results in the loss of the flood plain. Water compatible development only will be considered in such areas at risk of flooding which do not have existing development on them.

- SI16: Proposals which may be classed as 'minor development', for example smallscale infill, extensions to houses and small-scale extensions to existing commercial and industrial enterprises in Flood Zone A or B, should be assessed in accordance with the Guidelines for Planning Authorities on the Planning System and Flood Risk Management and Technical Appendices (2009), as revised by Circular PL 2/2014 and any future amendments, with specific reference to Section 5.28 and in relation to the specific requirements of the Strategic Flood Risk Assessment. This will include an assessment of the impact of climate change and appropriate mitigation. The policy shall be not to increase the risk of flooding to the development or to third party lands, and to ensure risk to the development is managed.
- SI17: To assist the OPW in implementing catchment-based Flood Risk Management Plans for rivers, coastlines and estuaries in the Dublin City area, including planned investment measures for managing and reducing flood risk, and have regard to their provisions/ recommendations.
- SI18: To put in place adequate measures to protect the integrity of flood alleviation infrastructure in Dublin City and to ensure new developments or temporary removal of any flood alleviation asset does not increase flood risk, while ensuring that new flood alleviation infrastructure has due regard to nature conservation, natural assets, open space and amenity values, as well as potential climate change impacts.
- SI19: To facilitate the provision of new, or the upgrading of existing, flood alleviation assets where necessary and in particular, the implementation of proposed flood alleviation schemes, on the Santry, Camac, Dodder, Wad, Naniken, Mayne, Tolka and Poddle rivers as well as Clontarf Promenade, Sandymount/ Promenade (northwards towards Irishtown Nature Park subject to the outcome of a flood/ environmental study), Liffey estuary and any other significant flood risk areas being progressed through the planning process to completion during the lifetime of the 2022-2028 Dublin City Development Plan, with due regard to the protection of natural heritage, built heritage and visual amenities, as well as potential climate change impacts.
- SI20: That there is a general presumption against the development of basements for residential use below the estimated flood levels for Flood Zones A or B (see Section 15.18.4 and Appendix 9 for further guidance).
- SI21: To minimise flood risk arising from pluvial (surface water) flooding in the City by promoting the use of natural or nature-based flood risk management measures as a priority, by requiring the use of sustainable drainage systems (SuDS) to minimise and limit the extent of hard surfacing and paving, and requiring the use of sustainable drainage techniques, where appropriate, for new development or for extensions to existing developments, in order to reduce the potential impact of existing and predicted flooding risk and to deliver wider environmental and biodiversity benefits, and climate adaption.

The Objectives of Dublin City Council are listed as:

- SIO10: To support and facilitate the OPW in its duty to maintain flood relief schemes completed under the Arterial Drainage Acts, 1945-1995, including the schemes at River Dodder (Tidal), River Tolka, River Wad (Clanmoyle) South Campshires and Spencer Dock.
- SIO11: To work with neighbouring local authorities when developing cross-boundary flood management work programmes and when considering cross-boundary development.
- SIO12: To work with the OPW in the development and implementation of catchment-based strategies for the management of flood risk – including those relating to storage and conveyance, and climate adaption.

Regarding the provision of Sustainable Urban Drainage Systems (Section 9.5.4 of the Plan), the Plan also outlines specific policies and objectives. The policies of Dublin City Council are listed as:

- SI22: To require the use of Sustainable Drainage Systems (SuDS) in all new developments, where appropriate, as set out in the Greater Dublin Strategic Drainage Study (Vol 2: New Development)/ Greater Dublin Regional Code of Practice for Drainage Works and having regard to the guidance set out in Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas, Water Sensitive Urban Design Best Practice Interim Guidance Document (DHLGH, 2021). Sustainable Drainage Systems (SuDS) should incorporate nature-based solutions and be designed in accordance with the Dublin City Council Sustainable Drainage Design & Evaluation Guide (2021) which is summarised in Appendix 12. SuDS should protect and enhance water quality through treatment at source while enhancing biodiversity and amenity.
- SI23: To require all new developments with roof areas in excess of 100 sq. metres to provide for a green blue roof designed in accordance with the requirements of Dublin City Council's Green & Blue Roof Guide (2021) which is summarised in Appendix 11.
- SI24: To require that all surface water run-off from new/ extended domestic driveways, repaired/ replacement driveways, and vehicular entrances (where such development is not exempted from the requirement to obtain planning permission), is managed through the use of SuDS, ensuring no increase in surface water discharges to the public drainage network (for further guidance, please refer to Appendices 5 and 12).
- SI25: To require the preparation of a Surface Water Management Plan as part of all new developments in accordance with the requirements of Appendix 13 – the Council's Surface Water Management Guidance.
- SI26: To require that all new surface water infrastructure within public or private developments be constructed in accordance with the standards set out within the Greater Dublin Regional Code of Practice for Drainage Works, irrespective of the management and maintenance regime proposed for the development or whether or not the development is intended to be taken in charge, in full or in part (i.e., infrastructure shall be to designed to taking in charge standards).

The Objectives regarding SuDs are given as:

- SIO13: To provide for new and improved surface water public networks, including projects undertaken in conjunction with Irish Water where applicable/ where required, in order to reduce pollution and negative impacts on receiving waters to allow for more sustainable development.

# 3. Overview of Flood Mechanisms at the Site

In broad terms, the potential sources of flooding at the site can be categorised as:

- Fluvial (river) flooding: the main risk of fluvial flooding is from the River Liffey.
- Tidal flooding/coastal flooding: the risk from tidal flooding is from surge events in the Irish Sea which can propagate up the River Liffey.
- Pluvial flooding: pluvial flooding occurs when the capacity of the local urban drainage network is exceeded during periods of intense rainfall. At these times, water can collect at low points in the topography and cause flooding.
- Groundwater flooding: this can occur during lengthy periods of heavy rainfall, typically during late winter/early spring when the groundwater table is already high. If the groundwater level rises above ground level, it can pond at local low points and cause periods of flooding.

Each of these potential sources of flooding is considered in this FRA.

## 3.1 Historical Flooding at the Site

### 3.1.1 Information from Floodmaps.ie

Reports and maps from the OPW's Flood Hazard Mapping website (www.floodinfo.ie) have been examined as part of this flood risk assessment.

Figure 3 presents an extract from this website for the site and its immediate vicinity. There are four recorded flood events in the vicinity of the site, as marked on the figure, and further details are provided in Table 4. A report on historical flooding within a 2.5km radius of the site is presented in Appendix B.

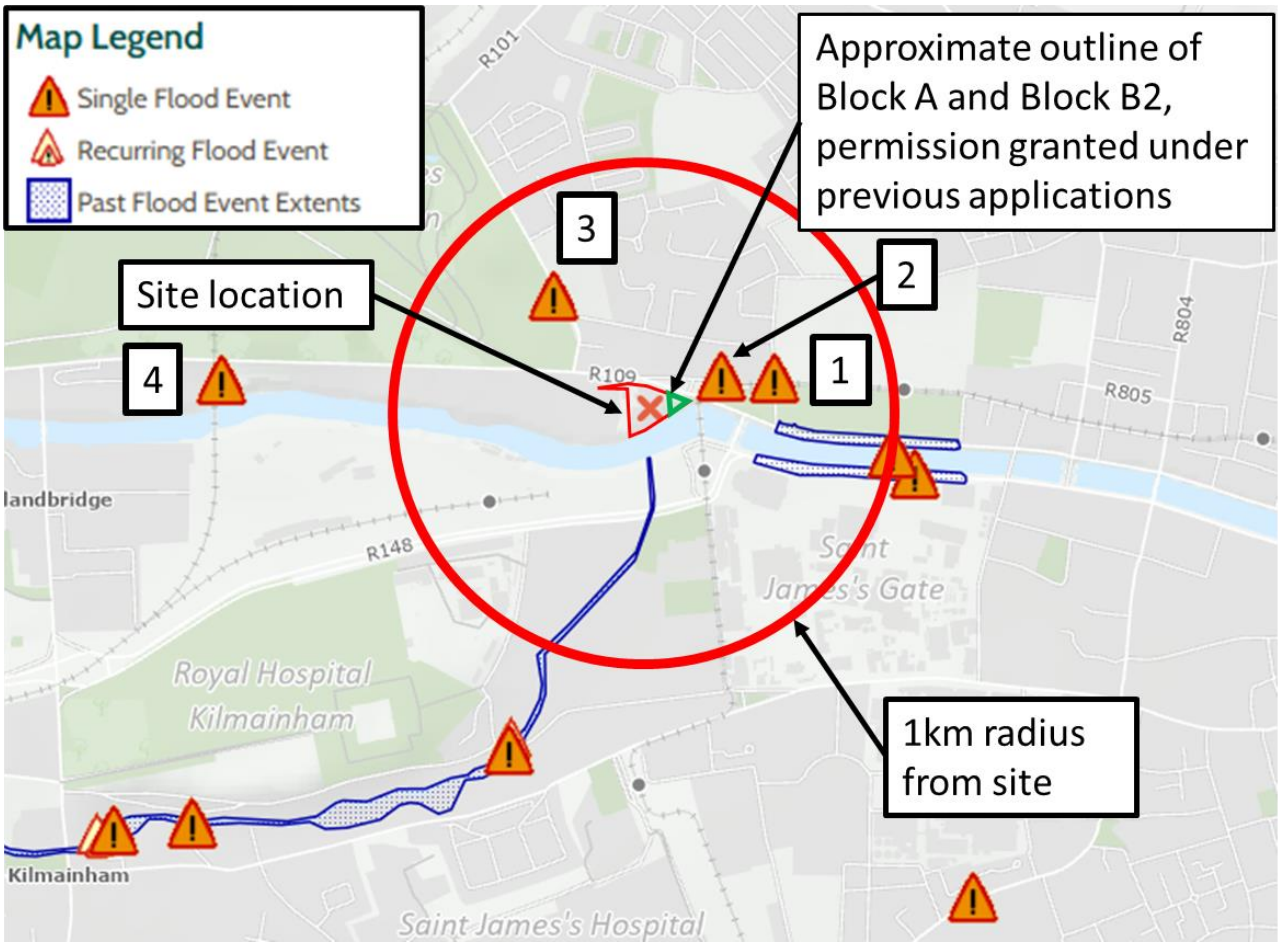


**Figure 3: Historical flooding events in the vicinity of the site (source: www.floodmaps.ie)**

As outlined in Table 4 below, all the flood events discussed were caused by the capacity of the local drainage network being exceeded, which led to overland flow and water collecting in localised low-lying areas. It is noted that the site of the proposed development was not flooded during any of these flood events.

There is no record of historical flooding of the site. The absence of a historical record of flooding however does not mean that the site has not flooded in the past.

**Table 4: Details on recorded historical flood events (source: www.floodmaps.ie)**

| | Location | Date | Source and cause | Flood depth | Impact |
|---|---|---|---|---|---|
| 1 | Aisling Hotel, Parkgate St, Dublin 8, approx. 100m from the proposed development | 24/10/2011 to 25/10/2011 | Significant rainfall resulted in overland flows from Conyngham Road. Some flow may have come from the Phoenix Park and possibly the nearby Viceregal Stream. The water then pooled in front of the Aisling Hotel and eventually flooded its ground floor entrance. Water from Montpellier Hill also came into the car park at the rear of the hotel | 0.15m at the front of the hotel | The Aisling Hotel was affected by this flood event. Benburb Street was flooded for 100m in front of the hotel. The Luas red line was flooded for 100m in front of the hotel. |
| 2 | Parkgate St, Dublin 8, approx. 100m from the proposed development | 14/06/2016 | No information on OPW FloodInfo website, but news reports state significant rainfall resulted in overland flows, exacerbated by blocked drains | Unknown | Roads flooded. No properties affected, but the Ashling Hotel reports it was required to erect flood barriers to prevent flood waters entering the property. |
| 3 | Infirmary Road, Dublin 7 | 22/11/2017 | No information on OPW FloodInfo website, but news reports state significant rainfall resulted in overland flows. | Unknown | The Infirmary Road near Phoenix Park was closed due to flooding |
| 4 | Bridgewater Quay Apartments, Islandbridge, Dublin 8 | 24/10/2011 | According to local residents, surface water runoff from the Phoenix Park flowed into the Bridgewater Quay apartment complex car park and onto the South Circular Road Bridge footpath. The area is in close proximity to the Magazine Stream, which rises in and transverses the Phoenix Park. The River Liffey did not burst its banks in this area, it flooded a low-lying pedestrian walkway. | 0.1m-0.5m | There were 11 ground floor apartments affected by the event. 30m of the South Circular Road Bridge and footpath were affected by this event. Part of the wall on the bridge also collapsed. |

### 3.1.2 Additional Historical Flood Information

From previous Flood Risk Assessments of sites in the vicinity of Parkgate Street, Arup has identified other historic flood events in the area, including:

- On 1st February 2002, Dublin City experienced a very high tidal event that flooded Victoria Quay which is approximately 130m from the site of the proposed development. The recorded tidal level for the event was 3.12mOD at the Sarah Bridge, approximately 0.5km upstream of the site.
- Victoria Quay (approximately 130m from site) was flooded on 24th October 2011.
- Victoria Quay and Wolf Tone Quay were both flooded on 3rd January 2014. The maximum recorded level during this event was 3.14mOD. Refer to Figure 4 below.

**Figure 4: Flooding at Victoria Quay in January 2014**

It is noted that the subject site has not been flooded in any of the historical flood events outlined above. While there have been recorded flood events in the vicinity of the proposed development site, there is no record of the site itself having flooded in the past.

## 3.2 Fluvial Flood Risk

Fluvial flood risk to the site has been assessed by assessing fluvial flood extents maps available produced as part of the Eastern CFRAM Study. Figure 5 presents an extract from the Eastern CFRAM Study fluvial flood extent map which highlights the flood extents for the 10%, 1% and 0.1% Annual Exceedance Probability (AEP) events. It can be seen from the figure that the site of the proposed development is outside the 1% Fluvial AEP flood extent. A very small area along the southern boundary is indicated as being within the 0.1% AEP extent.

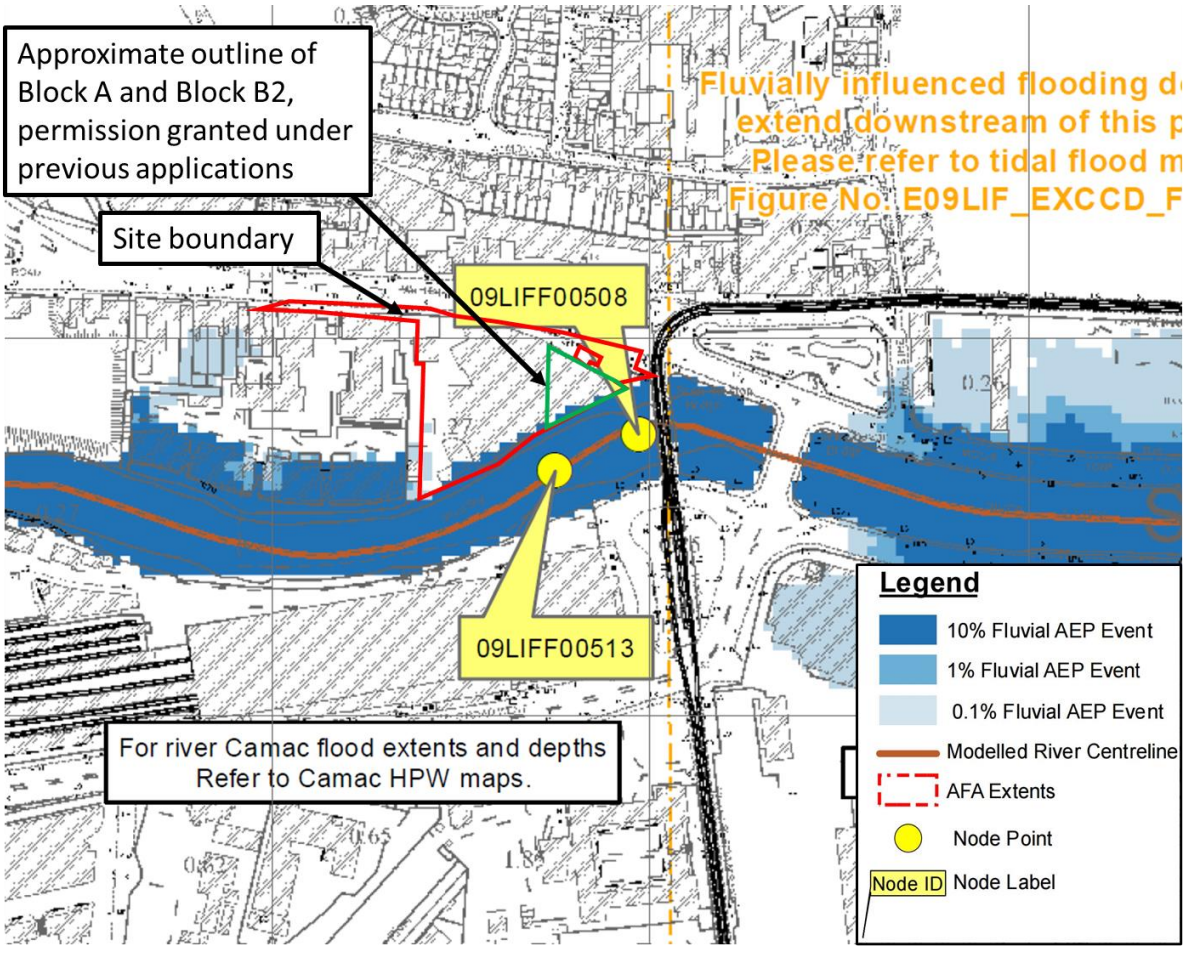


**Figure 5: Extract from the Eastern CFRAM Study fluvial flood extents map with application boundary overlaid**

Predicted maximum water levels from the hydraulic model used to generate the flood map for the nearest node point to the site are indicated in Table 5 below. It can be seen from the table that the maximum water level for the 1% AEP fluvial flood event level is 3.11mOD which is circa 200mm below the lowest existing ground level of the site along the southern boundary of the site (approximately 3.30mOD).

**Table 5: Maximum fluvial water levels at the model nodes closest to the site (source: Eastern CFRAM Study)**

| Node label | Water level (mOD) 10% AEP | Water level (mOD) 1% AEP | Water level (mOD) 0.1% AEP |
|---|---|---|---|
| 09LIFF00513 | 2.82 | 3.10 | 3.50 |
| 09LIFF00508 | 2.82 | 3.11 | 3.51 |

We note that in the Mid-Range Future Scenario (a future scenario taking potential climate change implications into account) the site will be at risk from fluvial flooding. This however will be addressed as part of the proposed development as outlined in Section 4 of the report.

## 3.3 Tidal/Coastal Flooding

The risk of tidal or coastal flooding has been assessed by examining the tidal flood extents maps available as part of the Eastern CFRAM Study.

Figure 6 presents an extract from the Eastern CFRAM Study tidal flood map which shows the flood extents for the 10%, 0.5% and 0.1% Annual Exceedance Probability (AEP) events. It can be seen from the figure that the site is outside the predicted 0.5% AEP flood extents.

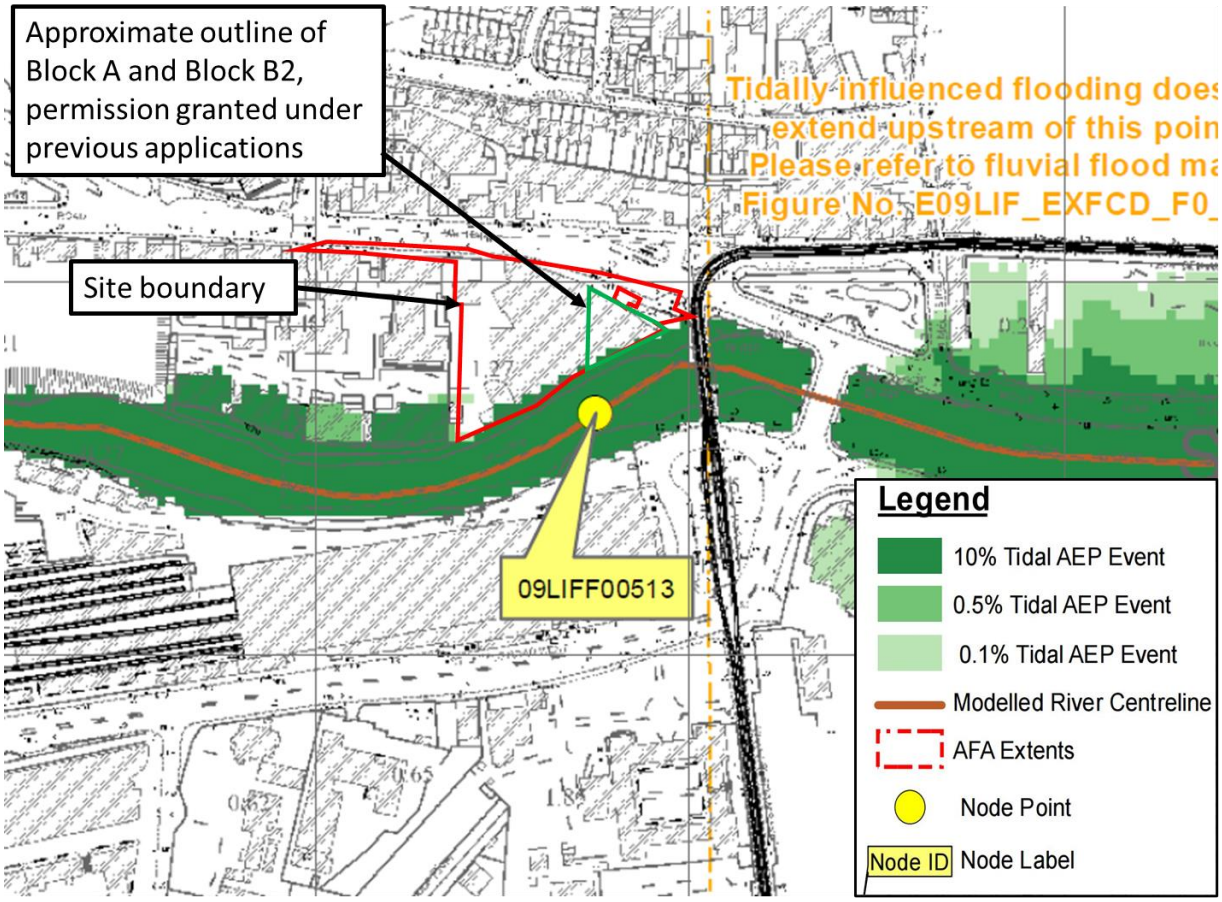


**Figure 6: Extract from the Eastern CFRAM Study tidal flood extents map with application boundary overlaid**

Predicted water levels from the hydraulic model used to generate the flood map for the nearest node point to the site are indicated in Table 6 below. It can be seen from the table that the peak 0.5% AEP water level is 3.27mOD which is circa 0.03m below the lowest existing ground level at the site along its southern boundary (circa 3.30m).

Table 6: Maximum tidal water level at the node closest to the site (source: Eastern CFRAM Study)

| Node label | Water level (mOD) 10% AEP | Water level (mOD) 1% AEP | Water level (mOD) 0.1% AEP |
|---|---|---|---|
| 09LIFF00513 | 2.86 | 3.27 | 3.48 |

We note that in the Mid-Range Future Scenario, the site will be at risk from tidal flooding. This however will be addressed as part of the proposed development as outlined in Section 4 of the report.

## 3.4 Pluvial Flooding

The risk of pluvial flooding at the site has been assessed using topographic information of the site and Parkgate Street. Figure 7 presents spot heights along Parkgate Street, as well as low points at the kerb at the locations of the street drainage gullies.

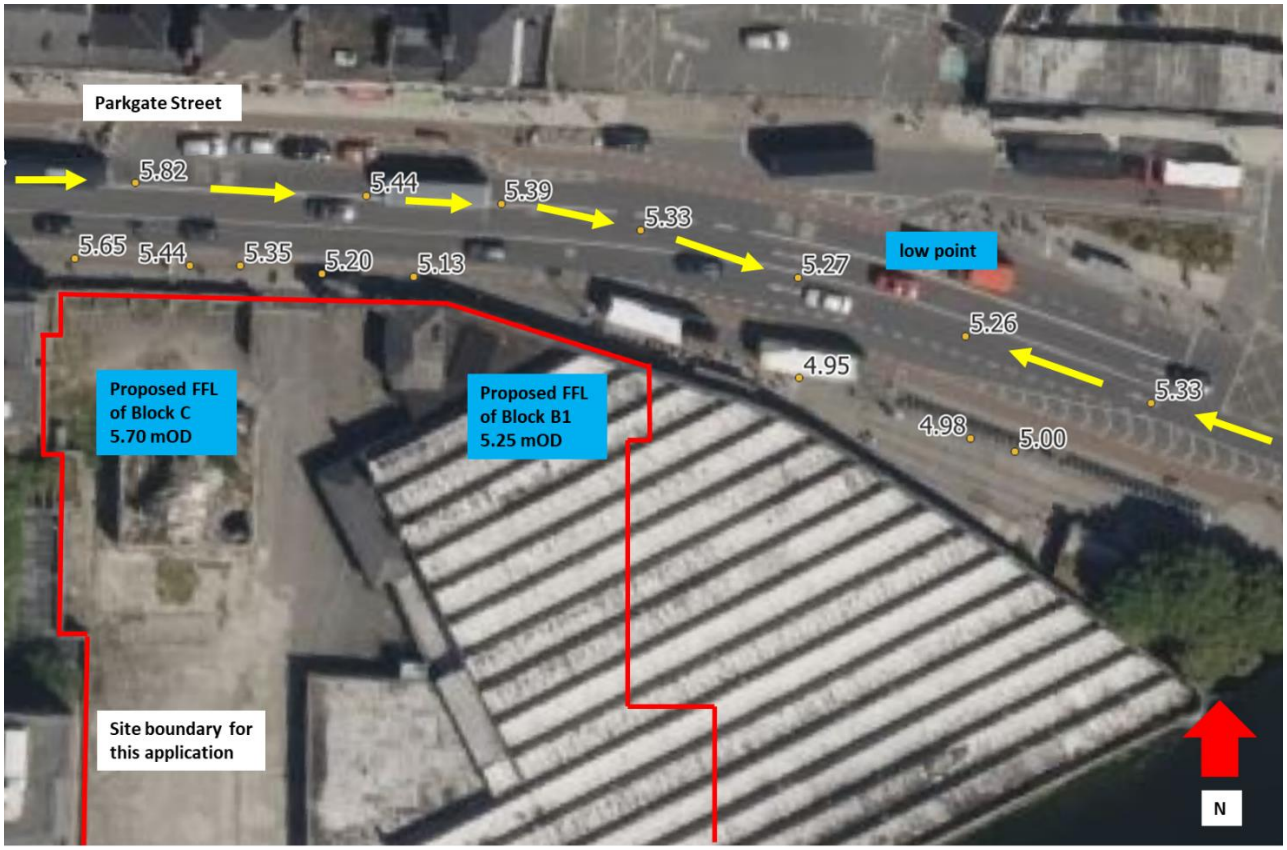


Figure 7: Extract from the Dublin Pluvial Study flood extents map, for the 10% AEP event

It can be seen from the figure that the levels of Parkgate Street fall in a south-easterly direction, with the street sloping from north to south in parts. This has the potential to direct pluvial runoff towards the entrance of the buildings on the site. In the event of an extreme rainfall event and/or blockage of the drainage system of the site, the capacity of the drainage system could be exceeded, leading to surface water ponding at the site. The site is therefore potentially at risk of pluvial flooding. This correlates with reports of historical pluvial flooding in the vicinity of the site, as detailed previously in Section 3.1.1.

## 3.5 Groundwater Flooding

Water levels in four boreholes were recorded over a four-week period between the 14th of August and 12th of September 2019, as part of the site investigation works for the proposed development. The groundwater level in the natural sand and gravel aquifer, and in the limestone bedrock aquifer varied with the tide during the monitoring period.

The groundwater levels for the four boreholes were electronically monitored and the maximum and minimum for the four locations are presented in the table below.

**Table 7: 2019 Site investigation groundwater levels**

| Location ID | Aquifer type | Maximum groundwater level (mOD) | Minimum groundwater level (mOD) |
|---|---|---|---|
| BH101 | Sand and Gravel | 1.18 | 0.18 |
| BH102 | Limestone bedrock | 0.91 | 0.12 |
| BH103 | Sand and Gravel | 1.08 | 0.82 |
| BH106 | Sand and Gravel | 1.45 | -0.38 |

The data shows that water was generally encountered between -0.38mOD and 1.18mOD, which is below the existing ground levels (3.30mOD – 5.5mOD) on the site. An undercroft is proposed at the site for bicycle parking, with a proposed level of 3.00mOD. A basement is also proposed for Block B1, with a minimum proposed level of 2.00mOD. Both are above the highest recorded groundwater level at the site.

Site investigation works were also conducted on the site in 2002 and 2003, and this data has been reviewed by Arup as part of this FRA. Groundwater monitoring standpipes were installed in 6 of 8 boreholes drilled on the site at that time. Water was generally encountered in the gravel aquifer at 3.0m - 4.0m below ground level. This would indicate that the groundwater level lies at approximately 0.5m – 1.0mOD Malin, which generally correlates with the 2019 site investigation data outlined above.

As the site is in close proximity to the River Liffey, it can be expected that there will be hydraulic connectivity between groundwater levels and tidal levels, as was confirmed during the 2019 site investigation. As existing ground levels and proposed levels of the development are higher than the tidal levels, the risk of groundwater flooding is considered to be low.

# 4. Proposed Mitigation Measures

## 4.1 Establishment of Design Flood Levels

### 4.1.1 Predicted 1 in 200 Year Tidal Level at the Subject Site

As established in Section 3.3, the 1 in 200 year (0.5% AEP) maximum tidal water level at the site is 3.27mOD. As this level is higher than the 1% AEP fluvial water level, it will be used as the flood level for the site.

### 4.1.2 Climate Change

The OPW has issued Draft Guidance on the “Assessment of potential future scenarios for Flood Risk Management”. This document suggests the use of two scenarios to assess climate change: a mid-range future scenario (MRFS) and a high-end future scenario (HEFS). The MRFS represents a likely future scenario which is within the bounds of the widely accepted projections. The HEFS is a more extreme, but plausible future event, and is within the upper bounds of the widely accepted projections. These are detailed within the table below.

**Table 8: Allowance in Flood Parameters for the Mid-Range and High-End Future Scenarios (source: extract from Table 3.2 OPW Climate Change Sectorial Adaption Plan)**

| Parameter | MRFS | HEFS |
|---|---|---|
| Extreme rainfall depths | +20% | +30% |
| Peak flood flows | +20% | +30% |
| Mean sea level rise | +500mm | +1000mm |

There are a number of conclusions that can be taken from the predictions made on climate change implications:

- Increases in sea levels may result in extreme tidal events, with tidal levels increasing by more than a meter in the next century; and
- Increase in the frequency of extreme events, particularly hydrological extremes, storms and droughts may cause an increase in rainfall intensity, duration and amount, resulting in increased surface water runoff.

Based on this, we propose accounting for climate change by considering a 500mm increase in the water levels in the estuary as per the Mid-Range Future Scenario.

### 4.1.3 Freeboard

A detailed freeboard analysis has not been undertaken as part of this study. However, it is generally recognised and accepted in Ireland, that a minimum freeboard of 300mm is appropriate, with a higher freeboard where this is justified.

A freeboard of 300mm has therefore been adopted as part of the study.

### 4.1.4 Recommended Site Flood Defence Level

From our analysis of the available data, the 200-year design tidal level at our site of interest was estimated to be 3.27mOD.

Allowing for climate change and freeboard the recommended design level of the proposed development can be calculated as:

> 3.27mOD (200-year tidal level) + 0.50m (climate change allowance) + 0.30m (freeboard allowance) = **4.07mOD Malin**

# 5. Management of Residual Flood Risk at the Site

## 5.1 Proposed Ground Floor Level

It is proposed to set the ground floor levels of the proposed buildings of the development between 5.2mOD and 6.0mOD. This is between 1.13m and 1.93m above the minimum recommended site flood defence level as outlined in Section 4.1.4.

Flood risk to the buildings of the proposed development is therefore remote. The development therefore complies with the OPW Planning Guidelines.

## 5.2 Basement of the Development

The basement area of the proposed development will be split into two sections: an undercroft in the southwest corner of the site at a level of 3.00mOD, and a basement in Block B1 with a floor level of 3.0mOD. To mitigate against the risk of groundwater ingress the basement will be fully sealed and tanked to ensure water cannot penetrate it.

It is noted that policy objective SI20 of the Dublin City Council Development Plan 2022 – 2028 states that "there is a general presumption against the development of basements for residential use below the estimated flood levels for Flood Zones A or B." The basement for the proposed development will be compliant with this objective as it includes plant areas, office staff changing facilities, and bicycle parking, and will not be for residential use.

## 5.3 Access and Egress Routes to the Site

The internal riverwalk (at the southwest corner of the site) will be graded to facilitate the future tie into the existing boardwalk along the River Liffey at a level of approximately 2.9mOD. The proposed internal riverwalk slopes and steps down from an access and egress point at the ground level public plaza which is at a level of approximately 4.9mOD. This is shown in Figure 8 below:

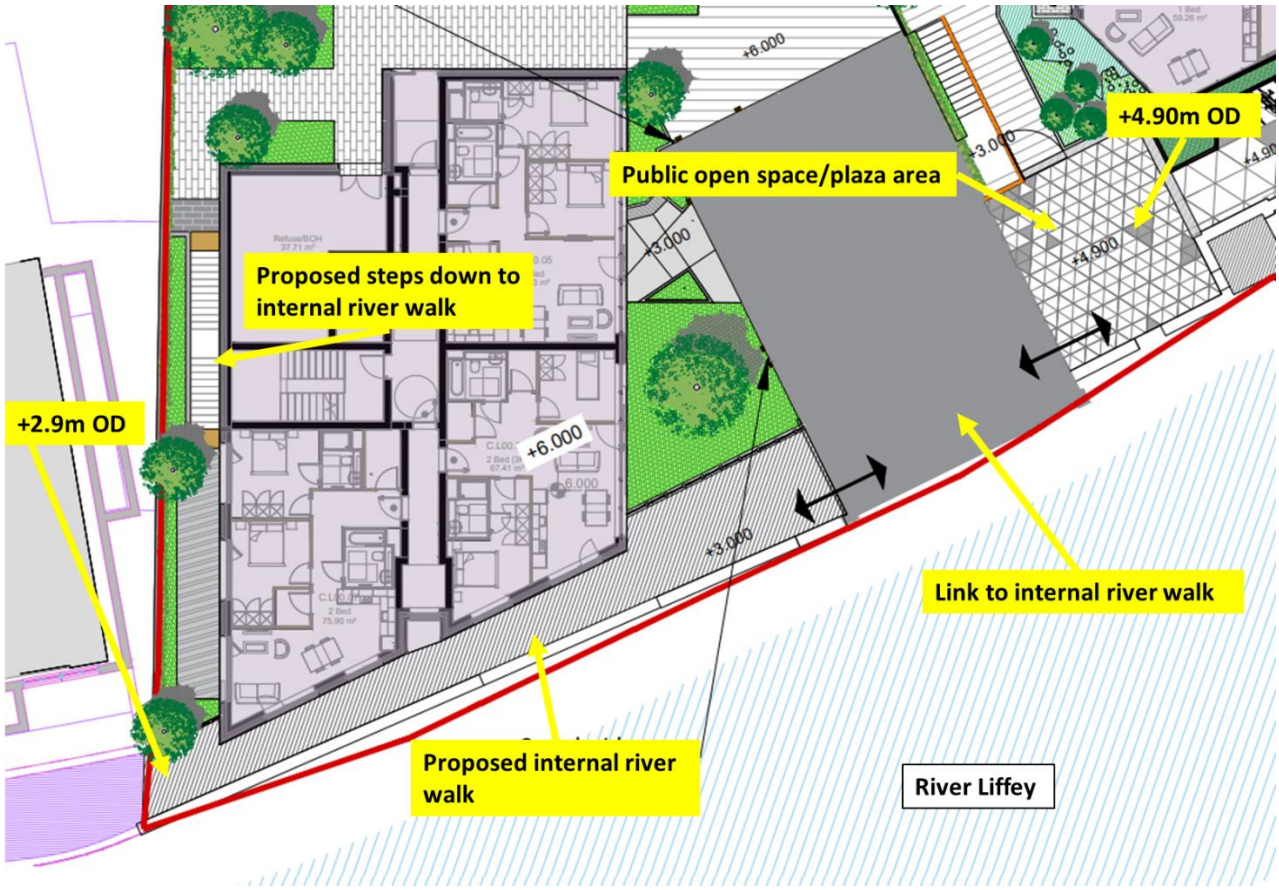


**Figure 8: Proposed internal river walk at the southwest corner of the site**

It can be seen from the figure that a section of the internal river walk is below the 1 in 200-year tidal flood level of 3.27m and the recommended site flood defence level of 4.12mOD. The access and egress point to the building at this location, however, is at a level of 4.9mOD and is not a main access and egress point to the building. It is proposed that a security door be installed at this point which can be closed during a flood event.

No other access and egress routes to the site will be compromised during flood events.

## 5.4 Storage and Conveyance

The proposed development will have no impact on floodplain storage and conveyance as it is located outside the 1 in 1000-year fluvial and coastal flood plain.

## 5.5 Pluvial Flood Risk

In the event of an extreme rainfall event and/or blockage of the drainage system of the site, the capacity of the drainage system could be exceeded, leading to surface water ponding at the site. There is a risk of surface water ingress to the proposed buildings as existing ground levels on Parkgate Street generally fall in a south-easterly direction towards the buildings. There is a low point on Parkgate Street where there is potential for surface water to pond, which is illustrated in Figure 9.

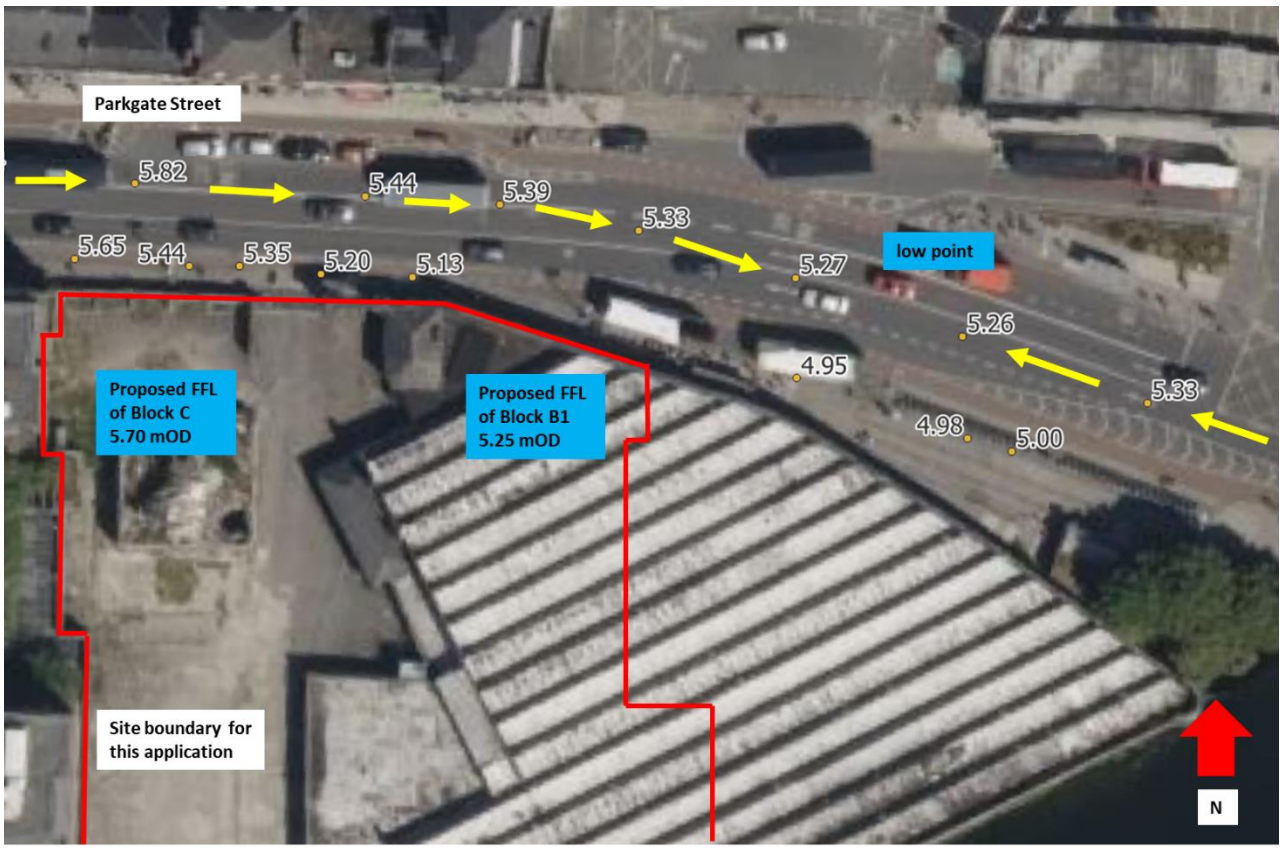


**Figure 9: Direction of surface water drainage flowpaths (source: adapted from Google Maps)**

In order to mitigate against surface water ingress to the proposed development, all doorways and entrance points to the building should be raised above external ground levels by 150mm. A minor fall should also be provided on all paved surfaces to direct surface water to the drainage system, or a drainage channel should be installed across the entrance point to collect surface water.

Further mitigation actions have been taken at the development site to mitigate against the risk of pluvial flooding. An agreement has been reached with Uisce Éireann and Dublin City Council for the development to redirect some of the gullies on Parkgate Street from the combined sewer and into a new surface water sewer which will run through the site to discharge directly into the River Liffey. This will remove part of the surface runoff from the combined sewer and will relieve the drainage system in the area, reducing the risk of pluvial flooding in the vicinity of the site.

## 5.6 Flood Emergency Plan

A tidal flood forecasting and warning system for Dublin Bay is operated by Dublin City Council and provides warnings of extreme tidal flooding. Extreme flood events will therefore be well forecast. As part of the emergency response plan, staff in the buildings of the proposed development will be kept well informed of flood and weather forecasts on an on-going basis as well as receiving warnings from Dublin City Council. In the event of a significant flood event being forecast, the emergency response plan will be implemented. This will involve ensuring that no occupants of the proposed development remain at a level below 4.12mOD (for instance at the internal river walk area next to the River Liffey).

# 6. Application of "The Planning System and Flood Risk Management" Guidelines

## 6.1 Vulnerability Classification

It is considered that the development should be classed as a "highly vulnerable development" as per the vulnerability classification presented previously in Table 2.

## 6.2 Flood Zones

Based on the analysis presented in this FRA report, the subject site is not at risk of flooding from either the 0.5% AEP tidal event or the 1% AEP event. A very small area of the site is marginally within the 0.1% AEP tidal and fluvial extents. While this level of flood risk could be interpreted as a Flood Zone C classification, we have adopted a conservative approach and considered the entire site as being within Flood Zone B.

## 6.3 Sequential Approach

Figure 10 below illustrates the sequential approach to be adopted under the "Planning System and Flood Risk Management Guidelines".

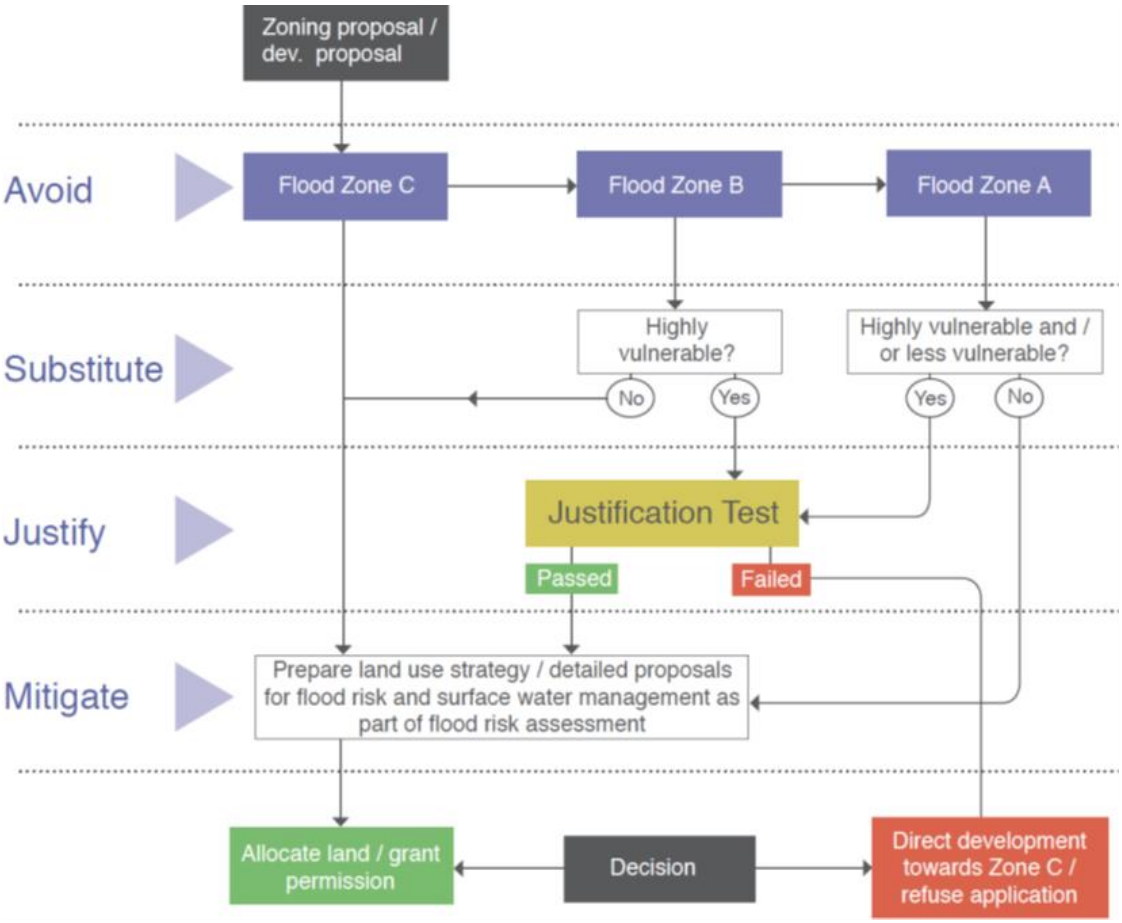


**Figure 10: Sequential approach mechanism in the planning process (source: OPW "The Planning System and Flood Risk Management" Guidelines)**

As per Figure 10 above, the proposed development is a "highly vulnerable development" (for residential use) that lies within Flood Zone B. A Justification Test for the development is therefore required and is presented in Section 6.4 and Section 6.5 of this report.

## 6.4 The "Plan Making Justification Test" from Chapter 4 of the OPW Flood Risk Management Guidelines

The Justification Test for Plan Making requires that three criteria must be met as shown in the following figure.

**Box 4.1: Justification Test for development plans**

Where, as part of the preparation and adoption or variation and amendment of a development/local area plan[1], a planning authority is considering the future development of areas in an urban settlement that are at moderate or high risk of flooding, for uses or development vulnerable to flooding that would generally be inappropriate as set out in Table 3.2, all of the following criteria must be satisfied:

1 The urban settlement is targeted for growth under the National Spatial Strategy, regional planning guidelines, statutory plans as defined above or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act, 2000, as amended.

2 The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement and, in particular:

(i) Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement[2];

(ii) Comprises significant previously developed and/or under-utilised lands;

(iii) Is within or adjoining the core[3] of an established or designated urban settlement;

(iv) Will be essential in achieving compact and sustainable urban growth; and

(v) There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement.

3 A flood risk assessment to an appropriate level of detail has been carried out as part of the Strategic Environmental Assessment as part of the development plan preparation process, which demonstrates that flood risk to the development can be adequately managed and the use or development of the lands will not cause unacceptable adverse impacts elsewhere.

N.B. The acceptability or otherwise of levels of any residual risk should be made with consideration for the proposed development and the local context and should be described in the relevant flood risk assessment.

**Figure 11: Justification Test for Development (source: OPW "The Planning System and Flood Risk Management" Guidelines)**

The "Plan Making Justification Test" relevant to the proposed development was completed and passed as part the Strategic Flood Risk Assessment (SFRA) undertaken for the Dublin City Council Development Plan 2022 – 2028.

The SFRA is included under Volume 7 of the DCC Development Plan and is available to download from the Dublin City Council website: (https://www.dublincity.ie/residential/planning/strategic-planning/dublin-city-development-plan/development-plan-2022-2028/volume-7-strategic-flood-risk-assessment-1).

The proposed development lies within Area 5 of the Justification Test Tables in the SFRA. The Justification Test Tables for Area 5 are included in full in Appendix D of this report.

## 6.5 The "Development Management Justification Test" from Chapter 5 of the OPW Flood Risk Management Guidelines

The "Development Management Justification Test" requires that two criteria must be met as follows:

1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.
2. The proposal has been subject to an appropriate flood risk assessment that demonstrates:
    a. The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk.
    b. The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible.
    c. The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and
    d. The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

### 6.5.1 Item 1

With regard to Item 1 above, the applicable policy context is the Dublin City Council Development Plan 2022 – 2028. Under the scheme the subject site is specifically identified as being included within Specific Development Regeneration Area (SDRA) No. 7 Heuston and Environs. Figure 12 presents an extract from the map for SDRA No.7. It can be seen that that the area is identified for Potential Redevelopment Site.

As the DCC Development Plan took full account of the OPW Guidelines and incorporated an SFRA as part of an appraisal of the plan, and the site has been designated for the form of development proposed, we can therefore state this this criterion is passed.

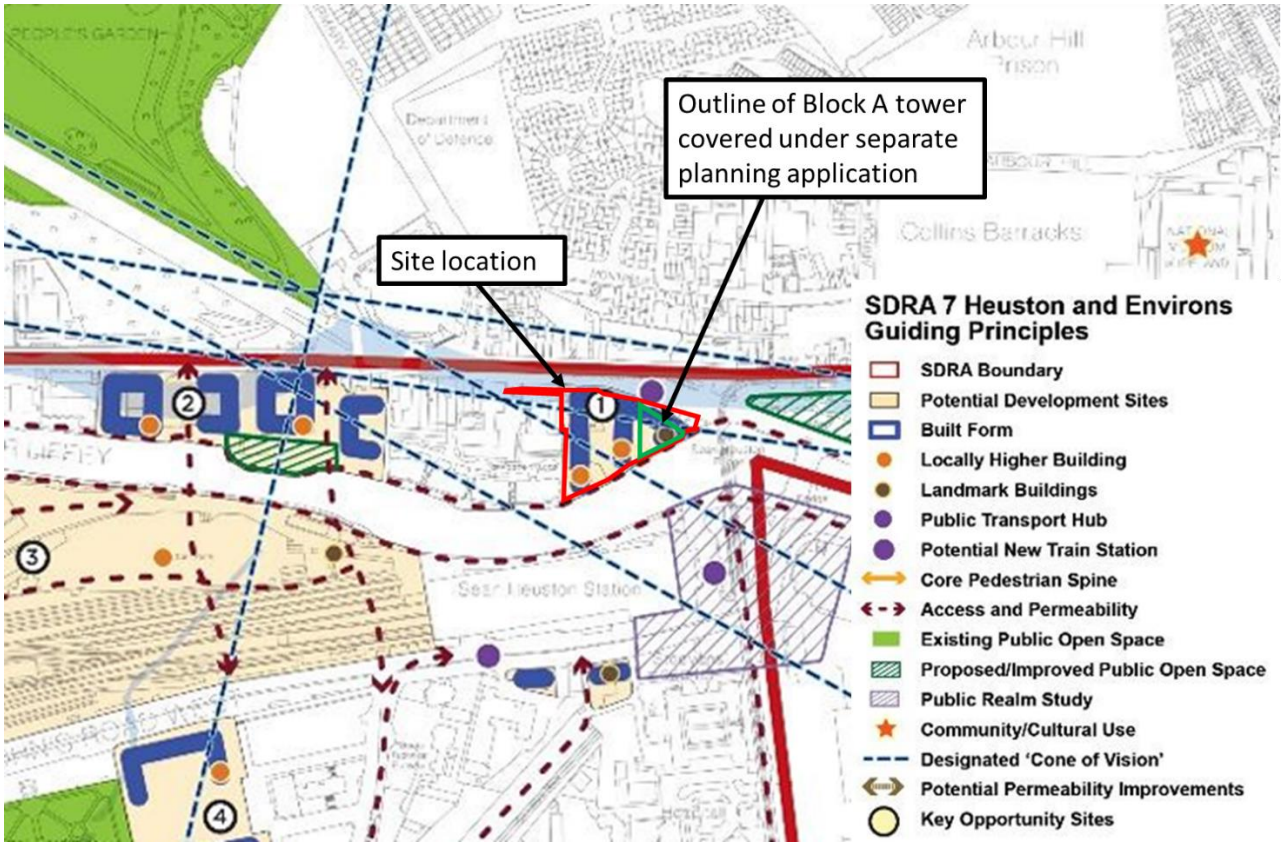


**Figure 12: Key development principles for SDRA Area No.7 (source: DCC Development Plan 2022-2028)**

### 6.5.2 Item 2

With regard to Item 2, we consider that these criteria have been met as follows:

- The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;

The proposed development will not increase the risk of flooding at adjacent sites. There will be no increase in the overall hardstanding area and the new drainage network to be provided as part of the development will be more effective than the current drainage on the site.

- The proposed development includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;

The development proposal includes a number of measures to minimise flood risk which include the following:

1. The ground floor levels of the proposed buildings on the site will vary between 5.2mOD and 6.0mOD. This is between 1.08m and 1.88m above the minimum recommended site flood defence level as outlined in Section 4.1.4.
2. The basement will be fully sealed and tanked to ensure that water cannot penetrate it.
3. The proposed development will have no impact on floodplain storage and conveyance as it is located outside of the 1 in 1000 year fluvial and coastal flood plain.
4. The proposed drainage network to be constructed as part of the development includes a number of Sustainable (urban) Drainage features (SuDS)

- The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measure and provisions for emergency service access

As previously noted in this report, the residual risk will be managed by ensuring that the ground floor level is set above the site design flood defence level.

- The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to the development of good urban design and vibrant and active streetscapes.

The scheme has been designed to the highest standards and creates a successful and vibrant public realm. Measures to address the flood risk have been incorporated into the design without compromising the streetscape and functioning of the development.

It is deemed that these criteria are sufficient for the development to pass this section of the Justification Test.

# 7. Conclusion

This FRA reviews the risk of flooding for a proposed mixed-use development at Parkgate Street in Dublin 8. This FRA is to form part of the planning application for the development.

There is no record historical flooding at the site.

While the site borders the River Liffey, flood risk to the site is low and existing ground levels are above the maximum 1% AEP fluvial water level and the 0.5% AEP tidal level. The risk of groundwater flooding is also low.

There is a risk of pluvial flooding at the site. This risk will be managed through grading of paved surfaces to direct surface water to the drainage system, and provision of drainage channels across entrance points to collect surface water. Further mitigation actions will be taken to remove part of the surface runoff from the combined sewer on Parkgate Street and relieve the drainage system in the area, reducing the risk of pluvial flooding in the vicinity of the site.

The minimum site flood defence level of the proposed development including an allowance for climate change and freeboard is 4.12mOD.

Flood risk to the buildings on site will be managed by raising ground levels to between 5.25mOD and 6.0mOD.

Access and egress routes will not be compromised during a flood event with the exception of the route to the internal river walk next to the River Liffey. This is not a primary access and egress route for the proposed development and the entrance/exit point to the building itself will be approximately 1.38m above the minimum site flood defence level.

The proposed development will also not impact on floodplain storage or conveyance.

As a small area of the existing site is within the 0.1% AEP tidal flood extent. The site is therefore classified as Flood Zone B and a Justification Test is required. Both the Plan Making and Development Management Justification elements of the Justification test have been assessed and both are deemed to be passed as part of this FRA.

# Appendix A

## Topographical Survey of Existing Site

# Appendix B

## Historical Flood Event Information

# Appendix C

## Eastern CFRAM Study Flood Maps

# C.1 Coastal Tidal Flood Extents

# C.2 Coastal Tidal Flood Depths 0.1% AEP

# C.3 Fluvial Flood Extents

# C.4 Fluvial Flood Depths 0.1 % AEP

# Appendix D

## The Plan Making Justification Test – Site 5. Liffey: Sean Heuston Bridge – Sarah Bridge, South Circular Road