BARRETT MAHONY
CIVIL & STRUCTURAL
CONSULTING ENGINEERS

Site Specific Flood Risk Assessment

Project:
Carlisle Residential Development, Kimmage Road West, Kimmage, Dublin 12

Job No.
21.221

DOCUMENT CONTROL

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Document No: 21.221 – IR – 22

DOCUMENT STATUS

Issue	Date	Description	Orig.	PE	Issue Check
PL1	05.12.24	Issued For Planning	MS	MS	Michael Hughes
PL2	16.04.25	Issued For Planning	MS	MS	Michael Hughes
PL3	23.05.25	Issued For Planning	MS	MS	Michael Hughes
PL4	29.05.25	Issued For Planning	MS	MS	Michael Hughes

Prepared by:

BMCE
52-54 Lower Sandwith Street
Dublin 2
D02WR26

Prepared for:

1 Terenure Land Ltd
27 Merrion Square
Dublin 2
D02P297

1. INTRODUCTION

1.1 GENERAL DESCRIPTION

Planning permission is being sought by 1 Terenure Land Ltd', for a proposed residential development at Carlisle Site, Kimmage Road West, Kimmage, Dublin 12.

The proposed Large Scale Residential Development will consist of 145 no. apartments (70 no. 1 bed and 75 no. 2 bed apartments) within 5 no. blocks (with blocks 4 and 5 linked throughout), ranging in height up to 5 storeys.

All residential units have associated private balconies/terraces to the north/ south/ east/ west elevations. The proposal will also include provision of a creche, cultural/ community space along with 89 no. car parking spaces, 465 no. bicycle parking spaces and 6 no. motorcycle parking spaces located at undercroft and surface level. Vehicular/pedestrian/cyclist access is provided off Kimmage Road West via the existing road which currently serves the Ben Dunne Gym.

All associated site development works, public open spaces, podium and ground level communal open space, landscaping, boundary treatments, plant and waste management areas, and services provision (including ESB substations) will be provided. Upgrades to the Uisce Eireann network along Kimmage Road West are also accommodated.

The site consists of approximately 1.25ha net site area and is bounded by residential dwellings to the north, east and west with Ben Dunne gym to the southwest. The site is currently greenfield. Refer Figure 1.1 and Site Plan Layout drawing in Appendix 1 for a satellite and a plan view of the site.

Figure 1.1: Site Location

1.2 SCOPE OF THIS REPORT

This SSFRA (site specific flood risk assessment) carried out by BMCE for the proposed development was prepared in accordance with the following relevant guidelines and policies:

- Department of the Environment Heritage and Local Government (DEHLG) and the Office of Public Works (OPW) Guidelines for Planning November 2009 on *'The Planning System and Flood Risk Management Guidelines for Planning Authorities'.* (including Circular PL 2/2014).
- The Planning and Development Act 2024.
- DCC Development Plan 2022-2028 (including the DCC Surface Water Management Guidelines)

The stages involved in the assessment of flood risk are listed in the OPW Guidelines for Planning November 2009 as follows:

- Stage 1: Flood Risk Identification
- Stage 2: Initial Flood Risk Assessment
- Stage 3: Detailed Flood Risk Assessment

The OPW and DEHLG's publication also outline a Sequential Approach for determining whether a particular development is appropriate for a specified location in terms of flood risk. The categorisation of the subject site in terms of the OPW and DEHLG's sequential approach is further outlined in Section 3.

2. STAGE 1: FLOOD RISK IDENTIFICATION

Stage 1 identifies whether there are any flooding or surface water management issues at the subject site location and whether a flood risk assessment is required. This involves review of desk study information available as outlined in the following headings. Sources of desktop study:

- OPW Flood Maps
- DCC SSFRA Document.
- OPW Recorded history of Flooding.

Table 2.1 The possible sources of flood water to proposed buildings.

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Tidal	Overtop Breach	Buildings	Very remote	High	Low
Fluvial	Overtop Breach	Buildings	Very remote	High	Low
Groundwater	Rising groundwater levels	Buildings	Very remote	Medium	Low
Pluvial Surface water	Overflow/ Blockage	Buildings	Possible	Medium	Medium

Note: We note that part of the site (access road & site perimeter) do fall withing the 1 in 100 year fluvial flood event.

2.1 HISTORICAL FLOODING

A review of the OPW Historical Flood Maps online was carried out and indicates no flooding events in the immediate vicinity of the site.

On 10th November 2000 flooding occurred due to significant rainfall in the Dublin Area and throughout the country. Rainfall in the South City was recorded as 135mm over 24 hours while gardens flooded along the Poddle Park, located approximately 300m to the east of the subject site.

Flooding occurred on 22nd April 2012 at the junction of Terenure Road and Kimmage Road approximately 300m to the southeast of the subject site. Records show that the source of the flood waters was the River Poddle, which was overtopped and flooding occurred at the culvert which went under the road.

Flooding occurred on Fortfield Road on 8th December 1954 approximately 400m to the south of the site. The Local Authority who provided this Flood Information item notes that a number of defence assets were put in place since this event.

Based on available and recorded information as outlined above, the subject site is not considered to have been subject to flooding in recent history. We note however, from information received from appellant from the recent planning grant, that the neighbouring property, no. 50 Kimmage Road West.

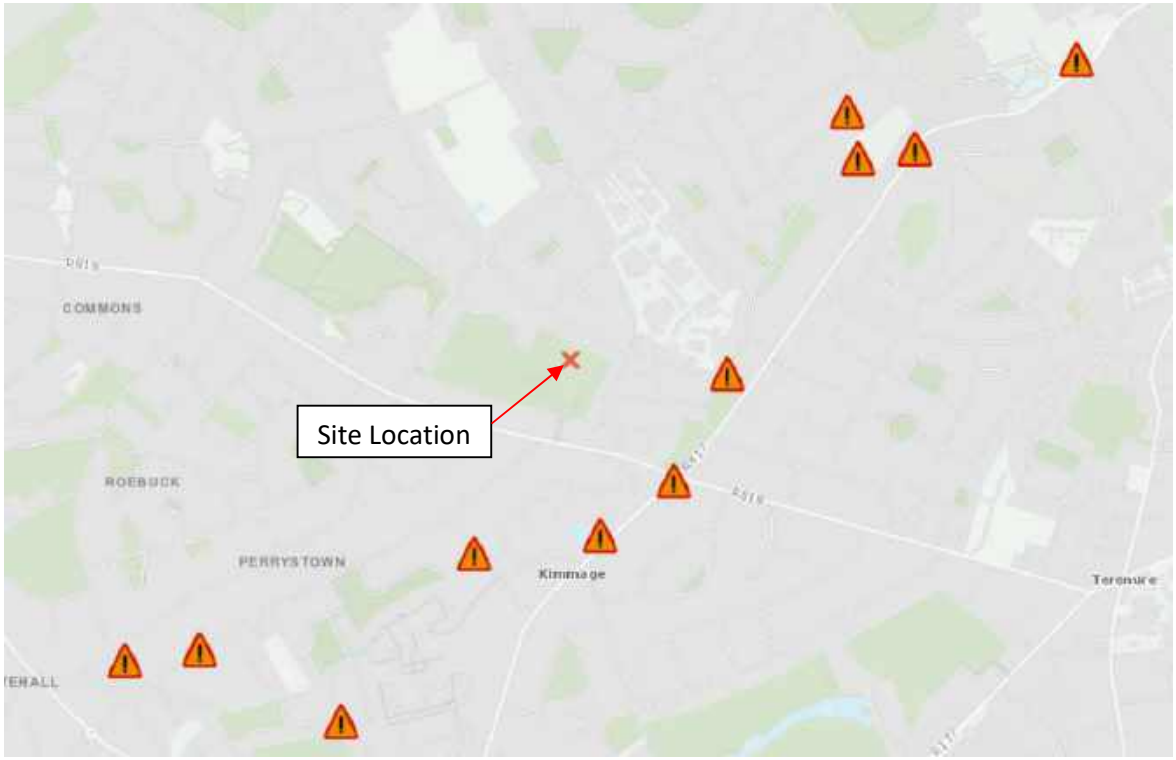

Figure 2.1 Recorded Past Flood Events (Source: OPW – www.floodinfo.ie)

2.2 COASTAL FLOODING

Coastal flooding occurs when sea levels along the coast of estuaries exceed neighbouring land levels or overcome coastal defences where these exist. A review of the OPW Tidal Flood Extents Mapping was carried out and indicates no coastal flooding at the subject site for the following flood event probabilities:

- 10% Tidal AEP (Annual Exceedance Probabilities) or 1 in 10 year return period.
- 0.5% Tidal AEP or 1 in 200 year return period.
- 0.1% Tidal AEP or 1 in 1000 year return period.

Therefore, the risk of tidal flooding is considered low as the subject site lies outside the 0.1% AEP.

Please refer to Figure 2.2 for OPW Tidal Flood Extents Mapping.

Figure 2.2 Tidal Flood Extends (Source: OPW Eastern CFRAM Study)

2.3 FLUVIAL FLOODING

Fluvial flooding occurs when rivers and streams break their banks and water flows out onto the adjacent low-lying areas. A review of the OPW Fluvial Flood Extents Mapping was carried out and indicates low and medium probability fluvial flooding at the eastern boundary of the subject site for the following flood event probabilities:

- 10% Fluvial AEP (Annual Exceedance Probabilities) or 1 in 10 year return period.
- 1% Fluvial AEP or 1 in 200 year return period.
- 0.1% Fluvial AEP or 1 in 1000 year return period.

The site is located approximately 300m to the west of the River Poddle. A review of the OPW Flood Maps database does not indicate any history of flood events at or near the subject site.

Flood risk modelling conducted on behalf of the OPW under the Eastern CFRAM (Catchment Flood Risk Assessment and Management) Study indicates that the subject site and access road is within an area with a fluvial flood event AEP of less than 1%. The risk of fluvial flooding within the site is therefore considered low. The OPW Fluvial Flood Extents Maps near the subject site is included in Appendix 2 for further information.

Please refer to Figure 2.3 for OPW Fluvial Flood Extents Mapping in the vicinity of the site.

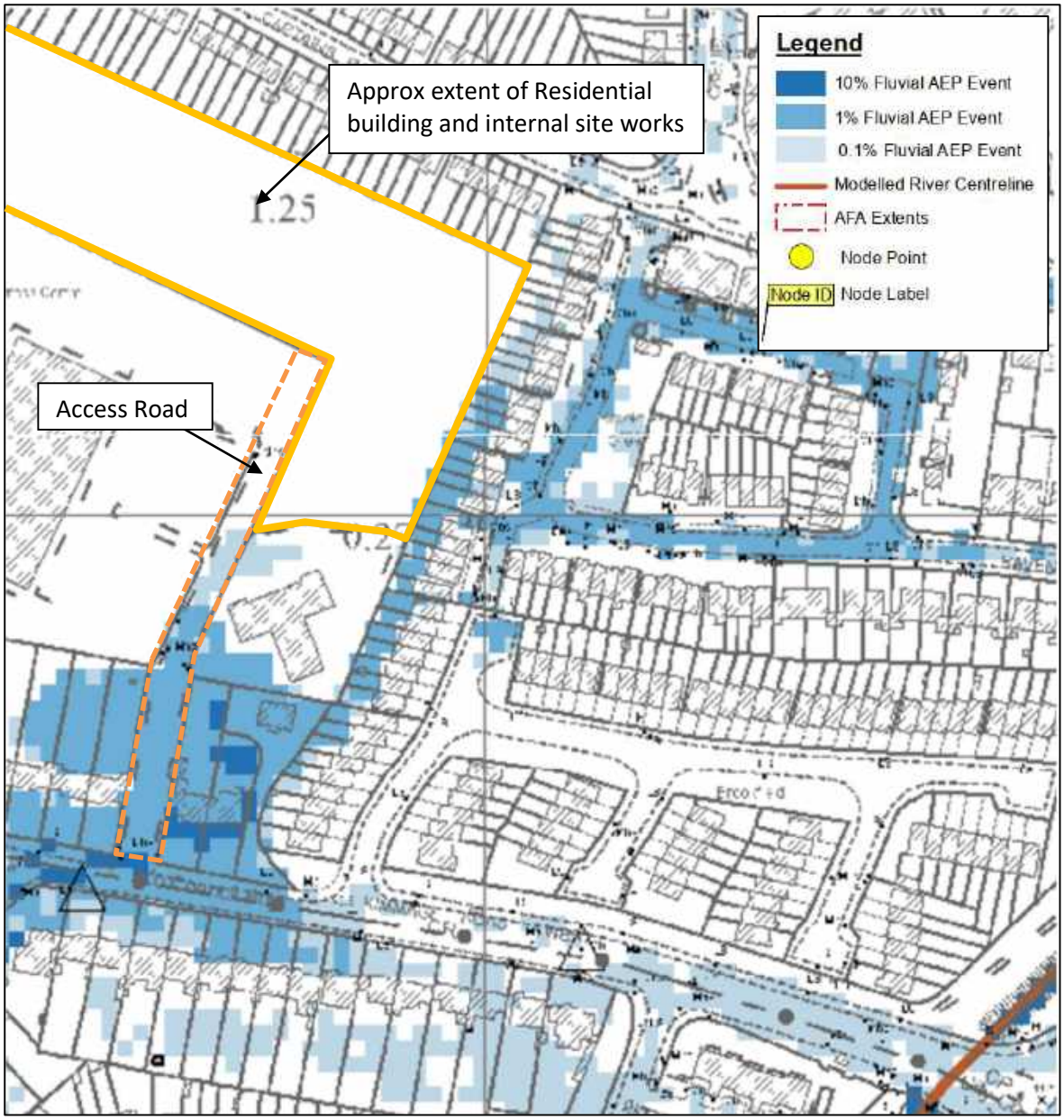

Figure 2.3 Fluvial Flood Extents (Source: OPW Eastern CFRAM Study)

2.4 GROUND WATER

Groundwater flooding occurs when the level of water stored in the ground rises as a result of prolonged rainfall, to meet the ground surface and flows out over.

Ground investigations have been undertaken by Ground Investigations Ireland, under the instruction of BMCE as part of the normal site investigation process for a development of this scale. Within the trial pits undertaken on the site, ground water seepage was encountered at depths varying from 1.9m to 2.9m BGL. Refer to Figure 2.4 below.

The locations of the site investigation exploration points are indicated in Appendix 4.

GI Ref	Water Level (mbgl)	Comments
BH01	2.90	Slight seepage
BH04	2.60	
BH05	2.80	Seepage at 2.80
CBR01	2.00	Slow seepage at 2.00m
TP01	2.40	Fast seepage at 2.40m
TP04	1.95	Slow seepage at 1.95m
TP06	2.90	Fast seepage at 2.90m
WM02	4.00	

Figure 2.4 Summary of Ground Water Strikes

The risk of flooding due to ground water ingress to the proposed development is considered low, as the ground water table is minimum 1.95m below existing ground level and recorded as deep as 4m below ground level.

2.5 PLUVIAL FLOODING

Pluvial flooding occurs when the amount of rainfall exceeds the capacity of urban surface water drainage systems or the ground to absorb it. A review of the available information on OPW Flood Maps website was carried out and indicates some pluvial flooding in the site. Note, these maps are 'predictive' flood maps showing areas predicted to be inundated during a theoretical or 'design' flood event with an estimated probability of occurrence, rather than information for actual floods that have occurred in the past, which is presented on 'historical' flood maps.

The FRC project considers the subject site to be low to medium risk of pluvial flooding as shown in figure 2.6 below.

A new surface water system is proposed to collect rainwater from all impervious areas of the proposed development along with green roof areas and landscaping to reduce the developments impact on existing surface water drainage systems. All stormwater will be attenuated and discharged at a controlled rate. The risk of pluvial flooding is considered low to medium, due to the proposed measures. Refer to the Infrastructure Report (Doc: 21.221-IR-01) submitted with this planning application for details of storm water attenuation and discharge rates.

Figure 2.6 Pluvial Flood Extents (Source: OPW Eastern CFRAM Study)

2.6 CLIMATE CHANGE

All new developments are required to take climate change into consideration when assessing the flood risk of a site. When designing for extreme rainfall events an allowance of 20% additional flow should be taken, as per the DCC Development Plan. The system is designed for storms up to and including the 1 in 100 year storm and 20% extra for climate change. Hence the development can be considered to be complaint with the flood risk management guidelines.

2.7 DUBLIN CITY & SOUTH DUBLIN COUNTY DEVELOPMENT PLAN – STRATEGIC FLOOD RISK ASSESSMENT MAPS

Flood zones have been identified throughout Dublin City Councils administrative area in the county's Strategic Flood Risk Assessment as part of the Development Plan 2022-2028. South Dublin Council Strategic Flood Risk Assessments were also reviewed to cross reference the flood zone areas. The maps show that the majority of the development site is in Flood Zone C, but identified a small area along the eastern boundary of the site as being in Flood Zone A and B. It has also identified the private third-party access road as being in both Flood Zone A and B. See Figure 2.7 for an extract of the flood zones map with the site area marked on for the purpose of this report.

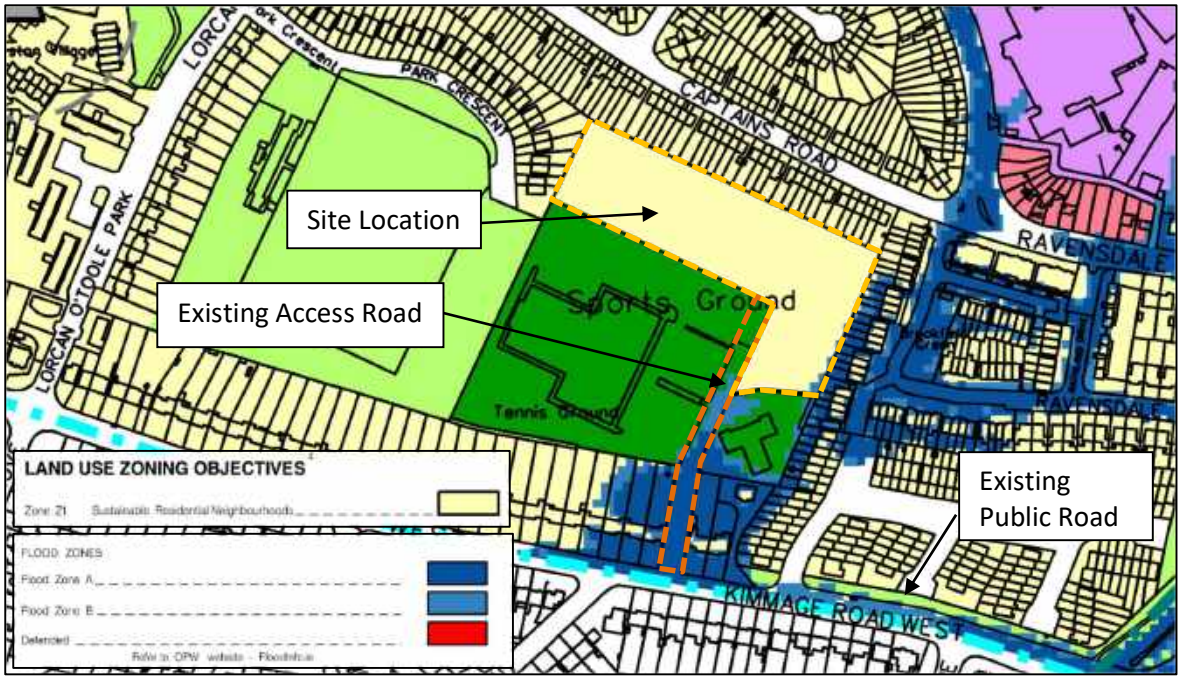

Figure 2.7 Land Use Zoning and Flood Zones with proposed residential site location and existing access road area overlaid (Source: DCC Development Plan 2022-2028 Map G)

3. RIVER PODDLE FLOOD ALLEVIATION SCHEME

3.1 RIVER PODDLE FLOODING HISTORY

The River Poddle rises in Cookstown, Tallaght and flows north-east through Tymon Park, following a circuitous route through Templeogue, Kimmage, Harold's Cross, Tenters and Temple Bar. The river catchment has become heavily urbanised in recent times, with the watercourse itself becoming regimented, altered and concealed to suit local habitation. The downstream reach of the Poddle in particular is heavily culverted, with the lower 4km flowing almost exclusively beneath the busy South Inner City streets.

There is a long history of flooding from the River Poddle due in no small part to the many historic man-made alterations to the watercourse. Throughout the course of the growth of Dublin City and the development of the Poddle catchment, the conveyance capacity of the river became increasingly constrained and natural areas of floodplain ultimately gradually reduced with increased urbanisation over the years. Due to the constrained nature of the river as it exists today, the Poddle is particularly susceptible to blockages from accumulating debris and fly-tipping at the various structures along its course. In recent times the most significant recorded instances have occurred in 1986, 1993, 2000, 2008 and most recently in 2011 (Source OPW FLoodinfo.ie).

3.2 PROPOSED RIVER PODDLE FLOOD ALLEVIATION SCHEME

Information on the River Poddle Flood Alleviation Scheme is available at https://www.poddlefas.ie/.

In June 2023, following the planning application made in February 2020, An Bord Pleanala granted planning approval for the River Poddle Flood Alleviation Scheme. Details on the approval can be

found at https://www.pleanala.ie/en-ie/case/306725. The appeal time for a Judicial Review has now expired.

The River Poddle flood alleviation scheme commenced on 6 Feb 2024, with the installation of the site Compound on the Limekiln Road side of Tymon Park along with the required removal of trees and vegetation in Tymon Park. Construction on the elements of the scheme will then commence in April 2024, with the initial stage of works being concentrated on the Tymon Park elements. This will consist of the engineered embankments, the flow control structure and the Integrated Constructed Wetlands.

The current estimated timeframe for the completion of the River Poddle Flood Alleviation Scheme is 2 years from start of construction (hence Q1 2026). The earliest anticipated occupation of the subject proposed development (if granted planning) is also circa 2 years.

3.3 BENEFITING AREAS FROM PROPOSED PODDLE FLOOD ALLEVIATION SCHEME

The scheme will increase the standard of flood protection on the River Poddle to protect properties at risk from the 1% Annual Exceedance Probability (AEP), or 1 in 100 year fluvial (river) flood, taking into account the anticipated increase in flows attributable to climate change. Upon completion, the scheme will alleviate flooding to the existing site access road and also the wider Kimmage area.

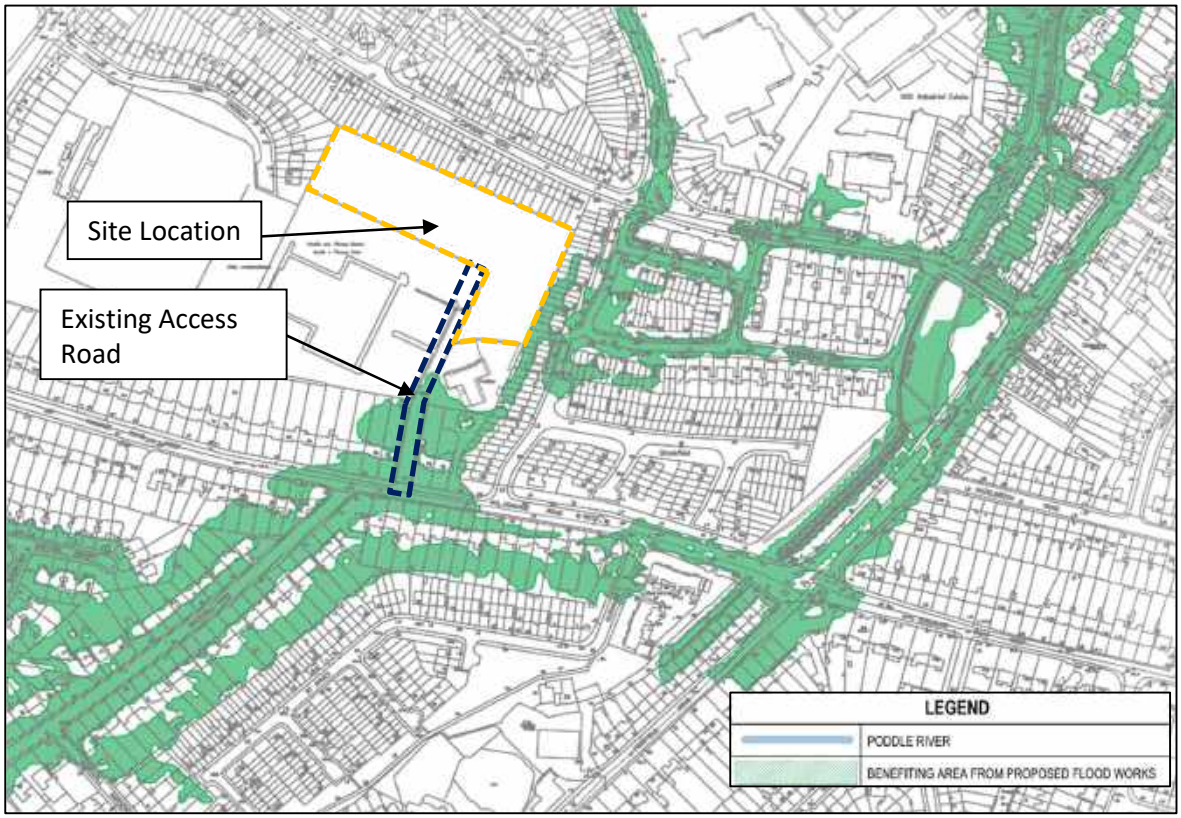

Figure 3.1 Benefiting Areas from Proposed Poddle Flood Alleviation Scheme (Source: www.poddlefas.ie).

4. STAGE 2: INITIAL FLOOD RISK ASSESSMENT

The purpose of an initial flood risk assessment is to examine flood risk issues highlighted as part of Stage 1 Flood Risk Identification.

Based on available and recorded information, there is evidence of the flooding on the access road and to adjacent properties, but vast majority of the site, including the locations of the proposed buildings, has not been subject to flooding in recent history.

The risk of tidal flooding is considered low as the subject site lies outside the 0.1% AEP.

The risk of fluvial flooding to the proposed development is considered low based on the Eastern CFRAM Study. The risk of flooding to the access road is medium.

The risk of flooding due to ground water ingress to the proposed development is considered low.

The risk of pluvial flooding is considered low, due to proposed surface water measures for the development and the Poddle Flood Alleviation measures.

The Dublin City Council Development Plan identifies a small area of the site, and the third-party access road of being in Flood Zones A and B.

4.1 SEQUENTIAL APPROACH

The sequential approach used in this assessment follows the guidelines from The Planning System and Flood Risk Management Guidelines for Planning Authorities, 2009, see Figure 4.1 for a graphical representation. As outlined in the OPW and DEHLG publication, new developments are divided into three categories which are as follows:

- Highly Vulnerable Development (i.e. power stations, residential)
- Less Vulnerable Development (i.e. retail, leisure)
- Water-compatible Development (i.e. car parking, recreational space)

The proposed residential development comes under the heading of Highly Vulnerable Development. As a small strip of landscaping for the residential development along the eastern boundary and the access road are in Flood Zone A & B.

Geographical areas are divided into three categories, based on their risk of river and tidal flooding. The three categories are as follows:

- Flood Zone A – where the 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 – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 and 0.5% or 1 in 200 for coastal flooding).

- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding i.e. all areas which are not within zone A or B).

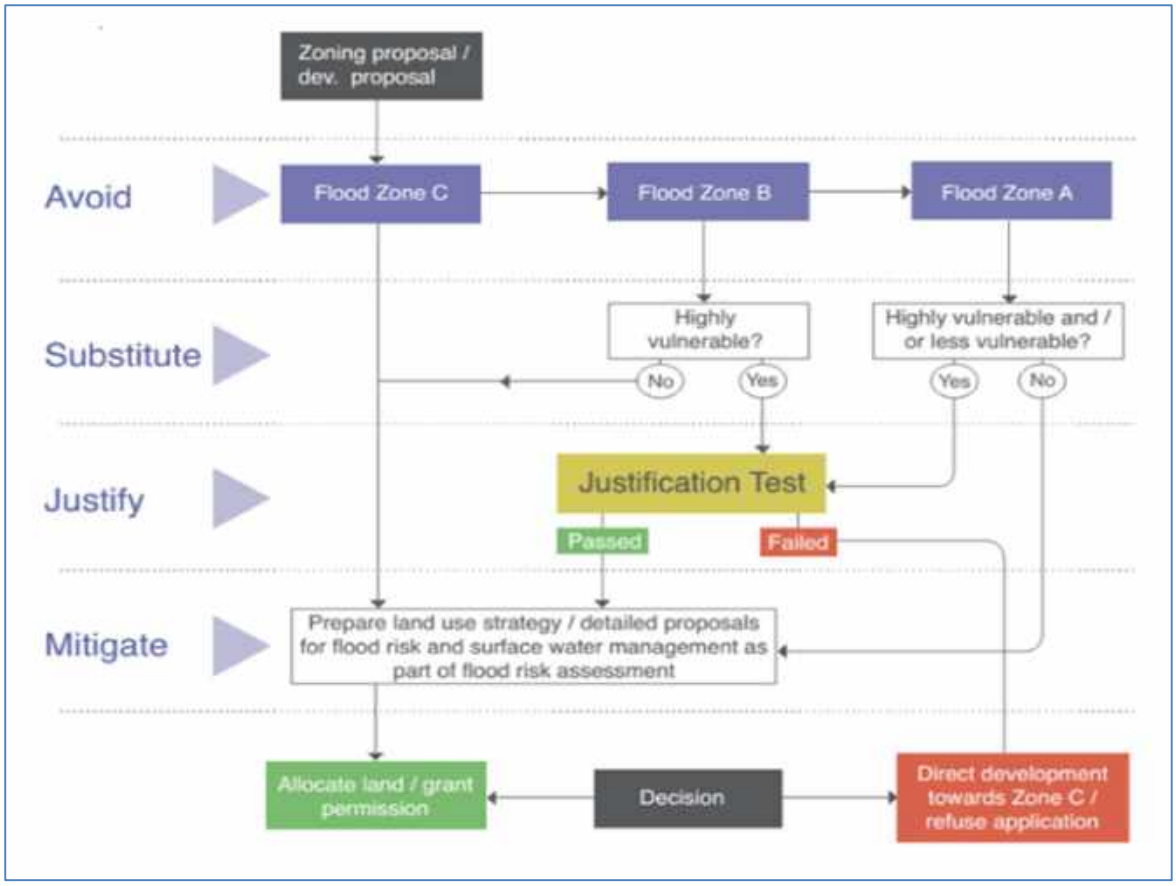

Figure 4.1 Sequential Approach (Source: Guidelines for Planning Authorities, 2009)

Table 4.1 Matrix of vulnerability versus flood zone (Source: Guidelines for Planning Authorities, 2009)

	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

An extract from DCC Development Plan 2022-2028, with the site plan marked up by BMCE, in Figure 2.7 shows that the vast majority of development site falls in Flood Zone C, while a small section of the site lies within Flood Zone A and Flood Zone B, however no habitable buildings are proposed in these areas. In addition, the existing third-party access road and the junction of same onto Kimmage Road West, falls within Flood Zone A and Flood Zone B.

Proposed site components in Flood Zones:

- Flood Zone A: Third Part Access Road, landscaping against eastern boundary.
- Flood Zone B: Third Part Access Road, landscaping against eastern boundary.
- Flood Zone C: Residential Buildings, car parking, internal road network, bin/bike store, all internal footpaths, vast majority of landscaped areas.

Albeit that the proposed works to the access road do not in any way change the flood risk, nonetheless a 'Justification Test' and / or Stage 3 Detailed Flood Risk Assessment will be carried out

as part of the SSFRA. This is being carried out because part of the site enclosed by the planning application red line falls with the Flood Zone A & B, i.e. the access road. The 2009 guidelines provide that if the proposed development is classified as highly vulnerable development within flood zone A/B, then a justification test is required to be completed.

5. STAGE 3: DETAILED FLOOD RISK ASSESSMENT

5.1 PROPOSED FLOOR LEVELS

It has been established that the applicable 1% AEP fluvial flood level at the site is +45.30m O.D. on along the eastern boundary of the site and +46.15m O.D. along the access road adjacent to the existing gallery. Refer to section 3.5 of Appendix 5 for the 1% and 0.1% AEP levels. The proposed development, a residential development, is defined as a '*Highly Vulnerable Development*'.

Typically, floor levels for a development are set on the basis of an allowance for climate change (20% increase in river flows and/or 0.5m sea level rise (mid-range future scenario)) and the appropriate freeboard (300mm) above the applicable 1% AEP flood level. On this basis, the recommended minimum ground floor level at the site is set at +45.30m OD. +0.3m freeboard = 45.60m O.D. The ground floor level has been set between 46.25m O.D. and 47.00m O.D. as a result. See table below, indication lowest ground floor finished floor levels for the residential, Cultural and creche uses of the proposed scheme:

Area Type	Lowest Ground Floor Level (m)
Residential	+46.775
Cultural Space	+46.45
Creche	+46.25

Table 5.1 Lowest Internal Finished Floor Levels

5.2 ACCESS & EGRESS FROM SITE

The site is accessed from Kimmage Road West via an existing c. 170m long access road. This access road also acts as the sole vehicle access to Ben Dunne Gym for customers, service vehicles and emergency services vehicles. It is not proposed to change the levels of this existing access road and therefore there is no increased flooding risk to the access road or surrounding properties. Certain resurfacing works and line marking are proposed to the existing access road, and certain underground services are proposed to be installed under the existing road.

In order to get more accurate flood depth information, 1 Terenure Land Limited appointed Punch Engineers to carry out detailed flood modelling of the access road. The modelling and report (contained in Appendix 5) supplements this SSFRA Report. The modelling is based on flooding scenarios without the Poddle Flood Alleviation Scheme, i.e. modelling is based on worst-case scenarios.

The flood modelling and depths analysis conclude that predicted flood depths are less than what appear on the OPW flood maps. During the 1%AEP flood event, the maximum flood depth on the access road is 160mm. The majority of the flooding is less than 100mm deep with some pockets between 100mm and 150mm deep. During the 0.1%AEP flood event, the maximum flood depth along the access road is 260mm. The majority of the flooding is less than 200mm deep with some smaller pockets between 200mm and 250mm deep. See figure 5.4 and 5.5 below, which are extracted from the addendum contained in Appendix 5 of this report.

Figure 5.4 Fluvial Flood Depths in a 1% AEP Event Showing Max Flood Depth (Source: Addendum to Site-Specific Flood Risk Assessment – See Appendix 5)

Figure 5.2 Fluvial Flood Depths in a 0.1% AEP Event Showing Max Flood Depth (Source: Addendum to Site-Specific Flood Risk Assessment – See Appendix 5)

As can be seen in the assessments of the OPW Flood Maps, and from the site specific flood modelling analysis, in both the 0.1% and 1% AEP fluvial flood events, the maximum flood depth of the access road does not exceed 0.5m. According to 'Safety criteria for the trafficability of inundated roads in urban floodings', published in the International Journal of Disaster Risk Reduction Volume 17, August 2016, Pages 77-84, the typical fording depths of emergency vehicles vary from 0.6m to 1.2m. Therefore, it is not anticipated that the flood levels will impact emergency access to and from site in the 0.1% and 1% AEP fluvial flood event. Furthermore, the proposed Puddle Flood Alleviation Scheme will further alleviate the flood risk to the access road on completion in 2027, refer to section 5.6 of this report.

5.3 Overland Flows from Adjacent Areas

The existing and proposed site levels are above the existing ground levels of the adjoining properties on Captains Road, Brookfield, Brookfield Green and Kimmage Road West. The Ben Dunne Gym car park and access road has its own surface water network and all surface a water run-off is guided towards existing surface water gulleys. In addition, the area of access road which is subject to flooding in the 0.1% AEP event, slopes away from the site towards Kimmage Road, and not in the direction of the proposed development.

5.4 Impact on Adjacent Properties

The levels and falls withing the proposed site layout and roadway, all follow the existing topography of the site, which descends from west to east, with a minor fall from south to north. As such the proposed development layout does not alter the existing overland flow routes of the existing site, and hence poses no increased flood risk to neighbouring properties in this regard.

A linear drainage channel is proposed along the northern edge of the site road to catch surface water from the road internal east-west road, to ensure no surface water run-off from the proposed development inadvertently flows into any neighbouring property along this boundary. As the eastern portion of the site is the lowest area on the site, the road and parking bays here have been designed to fall in the opposite direction to ensure surface water run off falls away from neighbouring properties and into a drainage channel adjacent to Block 4.

As discussed above the surface water system has been designed with a large area of blue roof storage. This blue roof, along with the 2 no. underground attenuation tanks, provide significant on-site storage for rainwater which can accommodate 1 in 100 year storms plus an additional 20% allowance for climate change.

As a result, there will be a significantly reduced surface water discharge discharge rate of the proposed development site, will reduce the load on the local SW network during storm events, thus reducing the flood risk to the wider area during such events.

Furthermore, given the additional green roofs which are now proposed under this FI response, technically it is possible to reduce the slightly the volume of the underground attenuation tanks. However, we have chosen not to do, and instead to maintain the tank size as previously submitted. This slight over provision of attenuation volume, acts to further mitigate flooding risk within the public system.

5.5 Reduction in Flood Risk Downstream

There is reduction in the flood risk downstream , due to the provision of the SuDS measures on the subject site. The capacity of the local surface water network and any resulting flooding in the locality was taken account of when designing the site surface water network and SuDS measures. Appendix 12 of the DCC Development Plan 2022-2028 requires the maximum site discharge rate to be "QBAR or 2 l/s/ha, whichever is greater".

The Institute of Hydrology Report no. 124 (IH 124, 1994) derived an improved flood estimation tool for small (<25km^2) catchments. The report developed a new equation to estimate the mean annual flood for small rural and urban catchments, Q_{BAR} (m^3/s). Q_{BAR} is calculated for a storm return period of 2.3 years. Thus, the runoff generated by a greenfield catchment in the 1 in 2.3-year return period. Refer to the Engineering Infrastructure Report for the detailed section on the Q_{BAR} calculation, equation and breakdown for the proposed development site.

In accordance with the GDSDS and local council requirements, the site surface water SuDS devices and attenuation system has been designed and developed to restrict the post development runoff for the 1 in 100-year storm + 20% climate change, to the predeveloped Q_{BAR} runoff rate (1 in 2.3-year return period). The downstream drains or watercourses which were previously taking the unrestricted greenfield run-off from the site when it was undeveloped (1 and 100 storms events and greater), will therefore be taking at a maximum a 1 in 2.3-year greenfield storm runoff post-development. This means that the provision of SuDS measures on the subject site, designed for the Q_{BAR} run-off rate from the site, has considerably reduced the flood risk downstream below the risk that existed even when the site was fully greenfield & undeveloped (with no hardstanding impermeable areas). For a typical site the greenfield run-off rate for a 100-year storm with a 20% climate change factor is approximately 3 times greater than that for the 1 in 2.3-year storm. The reduction of flow from the site is therefore significant.

The QBAR, or greenfield run off, for this site has been calculated as 4.46 litres per second (see section 2.3 above). The more conservative discharge value of 2.0 l/s/ha would result in a run-off rate of 2.47 l/s based on the site area of 1.25 ha.

The hydrobrake located just prior to the surface water outfall point, is designed to restrict flow to 2.47 l/s (2.0 /l/s/ha), and all surface water drainage and on-site attenuation has been designed based on this low discharge rate. This discharge rate is a 55% reduction on the current green field run off rate and 20% lower than the conservative value from the DCC Development Plan 2022-2028. The reduction of flow from the site is therefore significant, thus, increasing capacity of downstream receiving water courses.

5.6 Reduction in Flood Risk Due To River Poddle Flood Alleviation Scheme.

Construction of the Poddle Flood Alleviation Scheme commenced in April 2024, with construction expected to be complete in Q3 2027, according the Poddle Flood Alleviation Scheme website (www.poddlefas.ie). The scheme will increase the standard of flood protection on the River Poddle to protect properties at risk from the 1% Annual Exceedance Probability (AEP), or 1 in 100 year fluvial (river) flood, taking into account the anticipated increase in flows attributable to climate change. Upon completion, the scheme will alleviate flooding to the small area along the eastern boundary, and to the existing site access road.

Figure 5.4 Benefiting Areas from Proposed Poddle Flood Alleviation Scheme (Source: www.poddlefas.ie).

5.7 JUSTIFICATION TEST CRITERIA

Section 5.15 – 5.17 and 'Box 5.1' of the 'Planning System and Flood Risk Management – Guidelines for Planning Authorities' deals with the criteria that local authorities must consider when assessing flood risk assessment submitted as part of a planning application. See below extract.

Box 5.1 Justification Test for development management (to be submitted by the applicant)

When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, the following criteria must be satisfied:

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:
   - (i) The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;
   - (ii) The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;
   - (iii) 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
   - (iv) 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.

The acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.

Note: See section 5.27 in relation to major development on zoned lands where sequential approach has not been applied in the operative development plan.

Refer to section 5.28 in relation to minor and infill developments.

Figure 5.5 Justification Test Criteria – Extract Planning System and Flood Risk Management – Guidelines for Planning Authorities

5.8 JUSTIFICATION TEST RESPONSE

Justification Test Criteria to be Satisfied	Response
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.	• The proposed development type is in line with the Dublin City Development Plan Zoning – The site is zoned Z1 (Sustainable Residential Neighbourhoods).. • The existing access road falls is zoned Z10 (Inner Suburban and Inner City Sustainable Mixed-Uses) in the Dublin City Development Plan Zoning.
The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk.	As discussed in section 5.4 and 5.5 above, the development will not increase flood risk elsewhere, and will instead reduce the overall flood risk in the area and downstream. Furthermore, the area is to benefit from the Poddle Flood Alleviation Scheme, which commenced on 6 Feb 2024 and is anticipated to be complete by Q3 2027. Therefore, it is anticipated that the flood risk to the existing access road will not exist (be negligible) in a 1 in 100 year storm at the time of the first occupation of the proposed residential development.
The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;	All the proposed buildings with habitable space and the ESB substations and switch rooms all have a finished floor level 500mm minimum above the adjacent 0.1% AEP flood level. The bin and bike store to the east of the site has been moved so it is no longer located in the 0.1% AEP flood zone. All new internal roads within the development are not subject to flooding, and overland flow routes have designed to ensure no localised ponding or pluvial flooding occurs. In the event of a fire, occupants of the proposed buildings can escape the buildings to a place of safe refuge which is not at risk of flooding. The access road is easily trafficable by fire tenders and ambulances. According to the 'Safety criteria for the trafficability of inundated roads in urban floodings', published in the International Journal of Disaster Risk Reduction Volume 17, August 2016, Pages 77-84, the typical fording depths of emergency vehicles vary from 0.6m to 1.2m.

	During the 1%AEP flood event, the maximum flood depth on the access road is 160mm. The majority ofthe flooding is less than 100mm deep with some pockets between 100mm and 150mm deep (refer to Section 4.2 of Appendix 5). During the 0.1%AEP flood event, the maximum flood depth along the access road is 260mm. The majorityof the flooding is less than 200mm deep with some smaller pockets between 200mm and 250mm deep (refer to Section 4.2 of Appendix 5). Dublin Fire Brigade maintain trained paramedics within their fire tender crews. A Fire Tender could easily traverse the 160mm of static flood water, if required to attend a fire or medical emergency in the highly unlikely event that one would coincide with a 1 in 100 yr flood event. Furthermore, flood depth markers could be places along the access road to mark flood depths in increments of 100mm. However, all of the above would not even arise as an issue in a 1% AEP event, because the Poddle Flood Alleviation works shall be complete and afford protection to the existing access road and Kimmage Road, prior to the occupancy of the proposed residential development). Furthermore, as there would be no flood water in a 1% AEP event once the flood alleviation works are complete, full access and egress to pedestrians and private vehicles would not be effected. In a 0.1% event it, the typical flood depth of less than 200mm (maximum 260mm in area) is sufficient for a car to traverse. The flood depths are even less on the raised footpaths either side, and therefore should not physically impede pedestrian access or egress from the site in emergency and non-emergency situations. It should be noted, that in once the Poddle Flood Alleviation Scheme (FAS) works are complete, the flood depths in a 0.1% AEP event (as modelled in Appendix 5) will reduce as the flood volume from the 1% AEP event equivalent will be stored in upstream flood storage measures installed as part of the Poddle FAS.
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	The new internal road network and footpaths around the new buildings not subject to flooding.

protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and	The design of the surface water network will reduce the flood risk in the area and downstream in the surface water network. The existing site access road is subject to flooding in a 1% and 0.1% AEP event, until the Poddle Flood Alleviation works are complete. The predicted flood depths before the works are complete will not impinge emergency services accessing the site in in either flood event, as the deepest predicted flood depth on the access road in a 0.1% AEP event is 260mm (the majority of the access road being between 150 and 200mm – refer to Section 4.2 of Appendix 6) which is less than the 600mm minimum fording depth of an emergency vehicle. The flood depths of The Poddle Flood Alleviation Works will remove the flood risk to the access road in a 1% AEP event.
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.	The proposed development will deliver high quality apartments, at a time of significant need, with good urban design and vibrant and active streetscapes. The residual flood risk on the existing access road (which is very short term, if at all) does not detract from the high-quality urban design.

5.9 Response to Section 5.9 of the OPW Flood Risk Management Guidelines

The table below lists the items in Section 5.9 of the OPW Guidelines for Planning November 2009 on *'The Planning System and Flood Risk Management Guidelines for Planning Authorities' and* contains a response on how the reports and drawings, submitted as part of this application, address the items listed.

Items listed in Section 5.9 of the OPW Flood Management Guidelines.	**Response**
Plans showing the site and development proposals and its relationship with watercourses and structures which may influence local hydraulics.	The cause of flooding in the area near the site and the access road is a result of the exposed and culverted sections of the River Poddle flooding and causing flooding in the upstream surface water network. The River Poddle itself is located 250m from the nearest proposed building. The resulting 1% AEP flood event is overlaid on drawings CST-BMD-00-ZZ-DR-C-1052, and 0.1% AEP flood event is overlaid on drawings CST-BMD-00-ZZ-DR-C-1053. The layout of the proposed building is also contained on these 2 drawings to illustrate that these builds are not located in an area prone to flooding prior to the Poddle Flood Alleviation Scheme works being completed.
Surveys of site levels and cross-sections relating relevant development levels to sources of flooding and likely flood water levels;	A topographical survey was carried out on the existing site and is contained on drawing CST-BMD-00-ZZ-DR-C-1001. The topographical survey is also on drawings CST-BMD-00-ZZ-DR-C-1052 and CST-BMD-00-ZZ-DR-C-1053. Further assessment of the existing site levels and flood depths on the access road, is contained in Appendix 5 – Addendum to Site-Specific Flood Risk Assessment. This Addendum assess the topographical information and contains the results of the site-specific flood modelling in a 1% and 0.1% AEP Flood Event to establish flood water depths in both events.
Assessments of: - All potential sources of flooding; - Flood alleviation measures already in place; - The potential impact of flooding on the site; - How the layout and form of the development can reduce those impacts, including arrangements for safe access and egress;	This Site-Specific Flood Risk Assessment reviews available flood risk information for the OPW, and the DCC & SDCC Development Plans, including the Poddle Flood Alleviation Scheme measures which are current being implemented. The site has been designed so that no proposed structure lies within a flood zone and the surface system and SuDS measures have been designed to reduce surface water runoff from the site,

- Proposals for surface water management according to sustainable drainage principles; - The effectiveness and impacts of any necessary mitigation measures; - The residual risks to the site after the construction of any necessary measures and the means of managing those risks; and - A summary sheet which describes how the flood risks have been managed for occupants of the site and its infrastructure.	compared to the current greenfield surface water runoff scenario, refer to Section 5.5 above. The response to the Justification test, contained in Section 5.8 above, summaries the flood risk and how it has been assessed, managed and dealt with as part of the proposed design of buildings and infrastructure. It also summaries the flood risk on the access road and the access and egress of occupants and emergency service vehicles in the flooding scenario.

6. MITIGATION MEASURES

As noted in section 5.1, the proposed floor levels are kept a minimum 300mm above the 0.1% AEP flood event. This is a greater level of protection than a 300mm freeboard above flood level in a 1% AEP fluvial event as recommend by Dublin City Development Plan Strategy Flood Risk Assessment.

As noted in section 5.5, the site surface water system has been designed to 20% below the 2/l/ha requirement and 55% below the Qbar runoff rate, to further reduce the demand on the local surface water network.

The Poddle Flood Alleviation Scheme will defend against flood risk to the access road in the 1%AEP event including an allowance for climate change. It is estimated that this scheme will be completed in Q3 2027. Should the proposed scheme be advanced, the properties will not be occupied until 2027 at the earliest. No additional flood mitigation measures are therefore proposed for the 1%AEP event.

Following the completion of the Poddle FAS, a residual risk of flooding to the access road will remain in the event of defence overtopping or failure. In the unlikely event of such an occurrence, the site will be accessible by emergency vehicles as the predicted flood depths are well within fording depth limits of 0.6m to 1.2m.

7. CONCLUSION

This report outlines the findings of the SSFRA carried out for the mixed use, primarily residential development at Carlisle, Kimmage, Dublin 12. This SSFRA was carried out in accordance with the DEHLG guidelines for Planning 2009 and The Planning and Development Act 2000, and with reference to the DCC Development Plan 2022-2028 and SDCC Development Plan 2022-2028.

Based on available and recorded information, the site of the proposed residential blocks itself has not been subject to flooding in recent history. Adjacent areas, including part of the existing access road, however, have experienced flooding. However, the flood depths on the access road would not impinge access and egress for emergency service vehicles.

The risk of tidal flooding is considered very low as the subject site lies outside the 0.1% AEP.

The risk of fluvial flooding to the residential buildings and surrounding footpaths and roads is considered low as these areas lie outside the 0.1% AEP event. Fluvial flooding to the existing access road will not impact access and egress of emergency service vehicles.

The proposed Poddle Flood Alleviation Scheme will negate the risk of fluvial flooding on the existing access road and Kimmage Road west in the 1% AEP event.

The risk of flooding due to ground water ingress to the proposed development is considered low.

The risk of pluvial flooding is considered low, due to the site location and proposed measures for the development.

Based on the flood risk identification in Stage 1, the existing access road serving the proposed development falls in Flood Zone A & B. A justification test has been applied and the proposed development is deemed ‘Appropriate’ in accordance with the guidelines of the OPW’s publication.

Appendix 1

Site Layout

Notes
1. Copyright Reserved.
2. Work to figured dimensions only. Do not scale drawing.
3. The contractor is responsible for checking all levels and dimensions on site and shall refer all discrepancies to the Architect
4. Where appropriate, for details of r.c. structure, or mechanical and electrical details, see Engineers drawings.
5. Proprietary items shall be fixed in strict accordance with manufacturers instructions.
6. Sizes of proprietary items shall be checked with manufacturer.
7. The contractor shall be responsible for the coordination of structure, finishes and services.

Issue Status	
Progress	
Planning Application	■
Fire Cert	
Disability Cert	
Tender	
Construction	
As Built	
Information Only	

No.	Date	Revision	Initials
01	02/11/22	Issued for LRD Planning	BKD
02	19/04/23	Issued for LRD Planning	BT
03	08/05/23	Issued for LRD S247 SUBMISSION	BT
04	14/10/24	Issued for LRD S247 SUBMISSION	PG
05	06/12/24	Issued for Pre-Planning	BT
06	20/05/25	Blv/Bke store relocated to avoid potential flood zone	BKD
07	26/05/25	Blv/Bke store relocated to avoid potential flood zone	BKD

Project: Carlisle Site, Kimmage Residential Development
Drawing Title: Proposed Site Layout Plan - Sheet 1/2
Drawing No: 6269 LRD-P-003a
Scale: 1:500@A0 Rev: 07 Drawn: BKD Date: Dec 24

2ND FLOOR EUROPA HOUSE, BLOCK 9, HARCOURT CENTRE
HARCOURT STREET, DUBLIN 2, IRELAND
t +353-1-5183400
e architects@bkd.ie
bkdarchitects
BIKE·BROOK·DOYLE

Appendix 2

OPW Flood Maps

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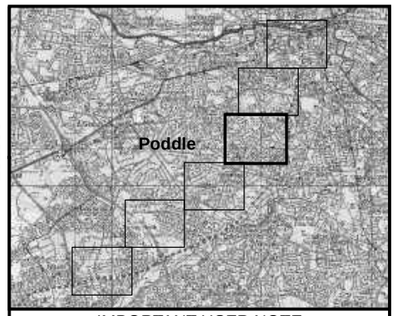
231800 231600 231400 231200 231000 230800 230600



IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

Legend

1% Fluvial AEP Flood Depth

- 0 - 0.25m
- 0.25 - 0.5m
- 0.5 - 1m
- 1.0 - 1.5m
- 1.5 - 2m
- >2m

Modelled River Centreline

AFA Extents

FINAL

REV:	NOTE:	DATE:

EASTERN CFRAM STUDY

OPW

RPS

The Office of Public Works
Jonathan Swift Street
Trim
Co Meath

Elmwood House
74 Boucher Road
Belfast
BT12 6RZ

T +44(0) 28 90 667914
F +44(0) 28 90 668286
W www.rpsgroup.com
E ireland@rpsgroup.com

Map:
Poddle River Fluvial Flood Depths

Map Type:	**DEPTH**	
Source:	**FLUVIAL**	
Map Area:	**HPW**	
Scenario:	**CURRENT**	
Drawn By :	**F.M.C.**	**Date : 20 October 2016**
Checked By :	**A.S.**	**Date : 20 October 2016**
Approved By :	**S.P.**	**Date : 20 October 2016**

Drawing No. :
E09POD_DPFCD010_F0_04

Map Series : Page 4 of 6

Drawing Scale : 1:5,000 @ A3

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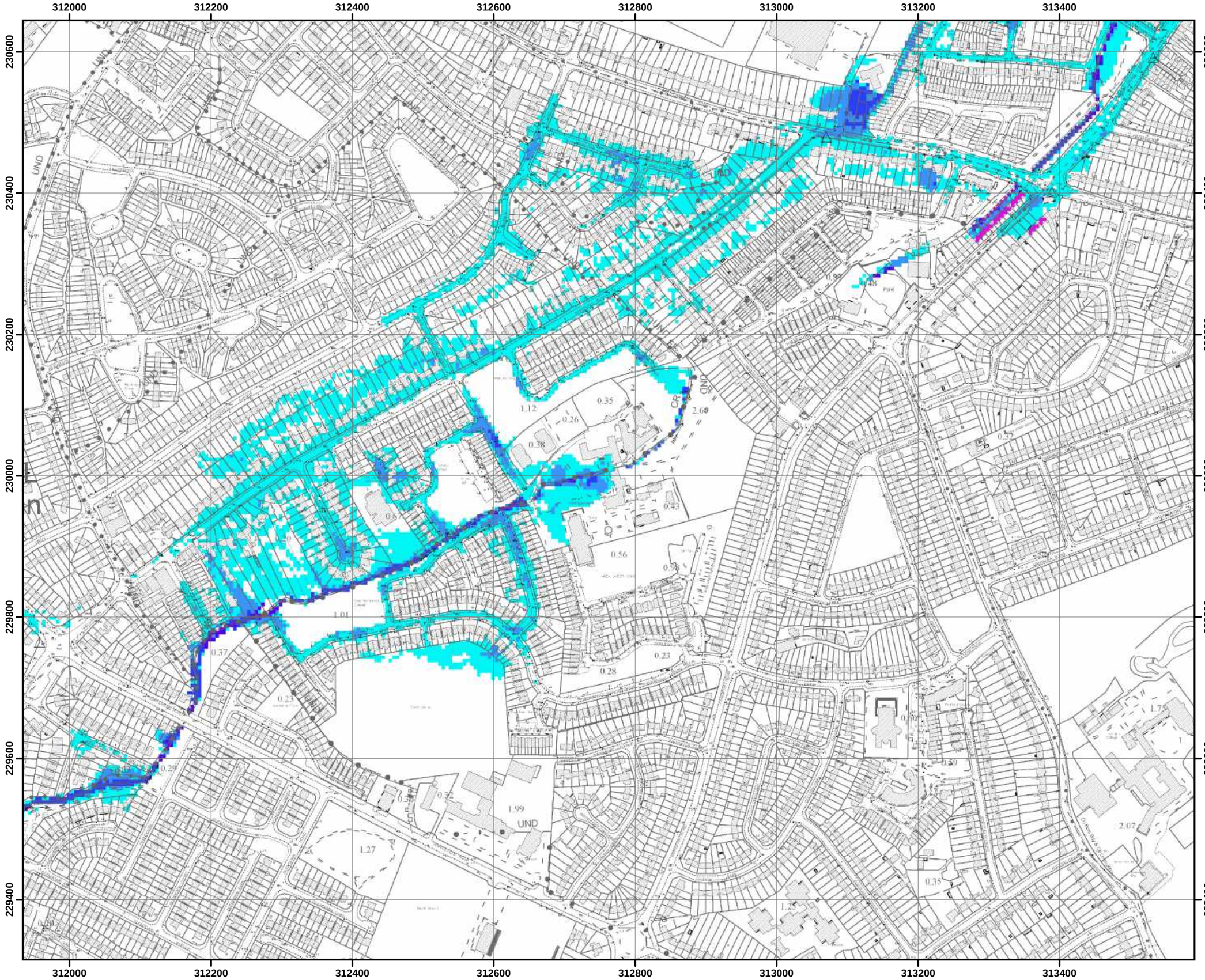

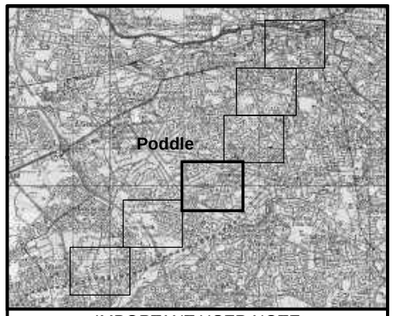

IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

Legend

0.1% Fluvial AEP Flood Depth

- 0 - 0.25m
- 0.25 - 0.5m
- 0.5 - 1m
- 1.0 - 1.5m
- 1.5 - 2m
- >2m
- Modelled River Centreline
- AFA Extents

FINAL

REV:	NOTE:	DATE:

EASTERN CFRAM STUDY

OPW

RPS

The Office of Public Works
Jonathan Swift Street
Trim
Co Meath

Elmwood House
74 Boucher Road
Belfast
BT12 6RZ

T +44(0) 28 90 667914
F +44(0) 28 90 668286
W www.rpsgroup.com
E ireland@rpsgroup.com

Map:
Poddle River Fluvial Flood Depths

Map Type:	DEPTH
Source:	FLUVIAL
Map Area:	HPW
Scenario:	CURRENT
Drawn By : F.M.C.	Date : 20 October 2016
Checked By : A.S.	Date : 20 October 2016
Approved By : S.P.	Date : 20 October 2016
Drawing No. :	E09POD_DPFCD001_F0_03
Map Series : Page 3 of 6	
Drawing Scale : 1:5,000 @ A3	

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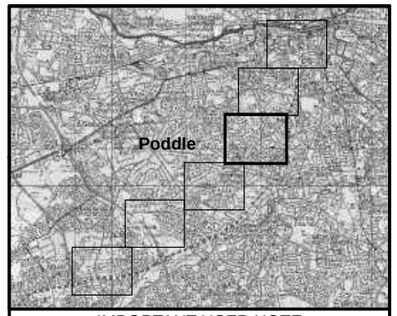
231800 231600 231400 231200 231000 230800 230600



IMPORTANT USER NOTE:
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Legend

0.1% Fluvial AEP Flood Depth

- 0 - 0.25m
- 0.25 - 0.5m
- 0.5 - 1m
- 1.0 - 1.5m
- 1.5 - 2m
- >2m

Modelled River Centreline

AFA Extents

FINAL

REV:	NOTE:	DATE:

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T +44(0) 28 90 667914
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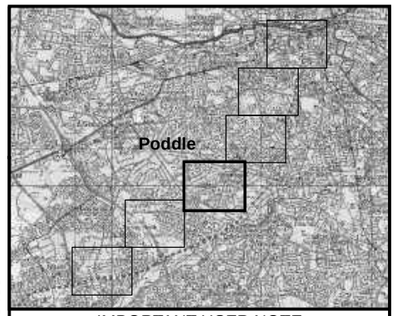
Map:	**Poddle River Fluvial Flood Depths**
Map Type:	**DEPTH**
Source:	**FLUVIAL**
Map Area:	**HPW**
Scenario:	**CURRENT**
Drawn By :	**F.M.C.** **Date : 20 October 2016**
Checked By :	**A.S.** **Date : 20 October 2016**
Approved By :	**S.P.** **Date : 20 October 2016**
Drawing No. :	**E09POD_DPFCD001_F0_04**
Map Series : Page 4 of 6	
Drawing Scale : 1:5,000 @ A3	

0 50 100 200 300 400 500 Metres

312000 312200 312400 312600 312800 313000 313200 313400

230600 230400 230200 230000 229800 229600 229400



IMPORTANT USER NOTE:
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Legend

1% Fluvial AEP Flood Depth

- 0 - 0.25m
- 0.25 - 0.5m
- 0.5 - 1m
- 1.0 - 1.5m
- 1.5 - 2m
- >2m

Modelled River Centreline

AFA Extents

FINAL

REV:	NOTE:	DATE:

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Co Meath

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74 Boucher Road
Belfast
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T +44(0) 28 90 667914
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W www.rpsgroup.com
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Map:
Poddle River Fluvial Flood Depths

Map Type:	DEPTH
Source:	FLUVIAL
Map Area:	HPW
Scenario:	CURRENT
Drawn By : F.M.C.	Date : 20 October 2016
Checked By : A.S.	Date : 20 October 2016
Approved By : S.P.	Date : 20 October 2016
Drawing No. :	E09POD_DPFCD010_F0_03
Map Series : Page 3 of 6	
Drawing Scale : 1:5,000 @ A3	

0 50 100 200 300 400 500 Metres

Appendix 3

Site Layout With Overlaid Flood Depths

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEERS & ARCHITECT'S DRAWINGS.FIGURED DIMENSIONS ONLY (NOT SCALING) TO BE USED. WHERE A CONFLICT OF INFORMATION EXISTS OR IF IN ANY DOUBT - ASK.
2. CONSULTANTS TO BE INFORMED IMMEDIATELY OF ANY DISCREPANCIES BEFORE WORK PROCEEDS.

PROPOSED BUILDING

PROPOSED BUILDING

Carlisle Health And Fitness Club

Car Park

NO ENTRY

EXIT

EXIT PARKING

SWAN NECK UNABLE TO SONDE

KIMMAGE ROAD W

KEY PLAN

SCALE @ A0: 1:5000
SCALE @ A2: 1:10000

LEGEND

1% FLUVIAL AEP FLOOD DEPTH

- 0 - 0.25m
- 0.25 - 0.50m
- 0.50 - 1m

FLUVIAL FLOOD DEPTHS: 1% AEP EVENT

SCALE @ A0: 1:250
SCALE @ A2: 1:500

ISSUE	DATE	DESCRIPTION	BY
PL1	23.05.25	ISSUED FOR PLANNING	AM
INF2	15.05.25	ISSUED FOR INFORMATION	AM
INF1	22.04.24	ISSUED FOR INFORMATION	AM

Project Engineer: MH | Project Director: CK

BM STAGE: **PLANNING**

BARRETT MAHONY
Dublin Office: Sandwith House, 52-54 Lower Sandwith Street, Dublin 2, Ireland. Tel: (01) 677 3200 Fax: (01) 677 3164
London Office: 12 Mill Street, London SE1 2AY, United Kingdom Tel: (0044) 20 3750 3530
Consulting Engineers, Civil . Structural . Project Management.E-mail: bmce@bmce.ie Web: www.bmce.ie

CLIENT: **1 TERENURE LAND LTD.**

PROJECT TITLE: **CARLISLE SITE KIMMAGE, RESIDENTIAL DEVELOPMENT**

BM PROJECT No.: **21.221**

MODEL	REFERENCE	SUITABILITY	REVISION

DRAWING TITLE: **FLUVIAL FLOOD DEPTHS: 1% AEP EVENT**

DWG	DRAWING REFERENCE	STATUS	REVISION
	CST-BMD-00-ZZ-DR-C-1052	PL	1

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEERS & ARCHITECT'S DRAWINGS.FIGURED DIMENSIONS ONLY (NOT SCALING) TO BE USED. WHERE A CONFLICT OF INFORMATION EXISTS OR IF IN ANY DOUBT - ASK.
2. CONSULTANTS TO BE INFORMED IMMEDIATELY OF ANY DISCREPANCIES BEFORE WORK PROCEEDS.

PROPOSED BUILDING

PROPOSED BUILDING

Carlisle Health And Fitness Club

Car Park

NO ENTRY

EXIT

SWAN NECK UNABLE TO SONDE

KIMMAGE ROAD W

House

KEY PLAN
SCALE @ A0: 1:5000
SCALE @ A2: 1:10000

LEGEND

0.1% FLUVIAL AEP FLOOD DEPTH

- 0 - 0.25m
- 0.25 - 0.50m
- 0.50 - 1m

UNDERGROUND ELECTRICITY LINE
ELECTRICAL MANHOLE
OVERHEAD LINE WITH POLE
OVERHEAD ELECTRIC
UNDERGROUND HV ELECTRICITY LINE
6m HIGH STREET LIGHT
MINI PILLAR
EIR
EIR CHAMBER
OVERHEAD LINE WITH POLE
ENET
ENET CHAMBER
COMMS
COMMS CHAMBER
VIRGIN
VIRGIN CHAMBER
FIBRE
FIBRE CHAMBER
AURORA TELECOM
AURORA TELECOM CHAMBER
CATV
CATV CHAMBER
BT
BT CHAMBER
ESAT
ESAT CHAMBER
SIRO FIBRE
SIRO CHAMBER
UNIDENTIFIED SERVICE
UNIDENTIFIED CHAMBER
EARTH LINE AND RODS
TRAFFIC SENSORS
CCTV POLE
UCAB UTILITIES CABINET

FOUL DRAINAGE
FOUL MANHOLE
STORM DRAINAGE
STORM DRAINAGE MANHOLE
COMBINED DRAINAGE
COMBINED DRAINAGE MANHOLE
PRODUCT DRAINAGE
PRODUCT DRAINAGE MANHOLE
CHEMICAL LINE
CHEMICAL MANHOLE
ROAD GULLY
GULLY TRAP
WATER MAIN
SLUICE VALVE
FIRE HYDRANT
WATER METER
SCOUR VALVE
PRESSURE RELEASE VALVE
AIR VALVE
NON-RETURN VALVE
FUEL LINE/TANK
GAS SV
GAS LINE
GAS HIGH PRESSURE LINE
GL 00.00 GROUND LEVEL (METRES - OD DATUM)
CL XX.00 COVER LEVEL (METRES - OD DATUM)
IL XX.00 INVERT LEVEL (METRES - OD DATUM)
SP/L50 DEPTH TO TOP OF SERVICE DUCT OR CABLE
SP ON MANHOLES = INVERT LEVEL OF CHAMBER
SP ON DRAINAGE = INVERT LEVEL OF PIPE
UTO UNABLE TO OPEN
OSA OUTSIDE SURVEY AREA
UTT UNABLE TO TRACE
SURVEYED AREA

FLUVIAL FLOOD DEPTHS: 0.1% AEP EVENT

SCALE @ A0: 1:250
SCALE @ A2: 1:500

ISSUE	DATE	DESCRIPTION	BY
PL2	29.05.25	ISSUED FOR PLANNING	AM
PL1	23.05.25	ISSUED FOR PLANNING	AM
INF2	15.05.25	ISSUED FOR INFORMATION	AM
INF1	22.04.24	ISSUED FOR INFORMATION	AM

Project Engineer: MH | Project Director: CK

BM STAGE: **PLANNING**

BARRETT MAHONY
Dublin Office: Sandwith House, 52-54 Lower Sandwith Street, Dublin 2, Ireland. Tel: (01) 677 3200 Fax: (01) 677 3164
London Office: 12 Mill Street, London SE1 2AY, United Kingdom Tel: (0044) 20 3750 3530
Consulting Engineers, Civil , Structural . Project Management.E-mail: bmce@bmce.ie Web: www.bmce.ie

CLIENT: **1 TERENURE LAND LTD.**

PROJECT TITLE: **CARLISLE SITE KIMMAGE, RESIDENTIAL DEVELOPMENT**

BM PROJECT No.: **21.221**

DRAWING TITLE: **FLUVIAL FLOOD DEPTHS: 0.1% AEP EVENT**

DRAWING REFERENCE	STATUS	REVISION
CST-BMD-00-ZZ-DR-C-1053	PL	2

Appendix 4

Site Investigation Exploration Points (including Ground Water Monitoring)

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEERS & ARCHITECT'S DRAWINGS.FIGURED DIMENSIONS ONLY (NOT SCALING) TO BE USED. WHERE A CONFLICT OF INFORMATION EXISTS OR IF IN ANY DOUBT - ASK.
2. CONSULTANTS TO BE INFORMED IMMEDIATELY OF ANY DISCREPANCIES BEFORE WORK PROCEEDS.

SITE INVESTIGATION EXPLORATION POINTS

SCALE @ A0: 1:250
SCALE @ A2: 1:500

LEGEND

- IF1 — INFILTRATION TESTS TO BRE365 (4 No.)
- TR1 — TRIAL PIT (8 No.)
- BH1 — BOREHOLE (5 No.)
- CBR1 — CBR TEST (3 No.)
- WM — WATER MONITORING (2 NO.)
- RC1 — ROTARY CORE (3 NO.)

ISSUE	DATE	DESCRIPTION	BY
PL4	29.05.25	ISSUED FOR PLANNING	AM
PL3	15.08.23	ISSUED FOR PLANNING	AM
PL2	04.02.22	ISSUED FOR PLANNING	MR
PL1	08.10.21	ISSUED FOR PLANNING	MR
INF2	26.08.21	ISSUED FOR INFORMATION	SM
INF1	05.07.21	ISSUED FOR INFORMATION	SM

Project Engineer: MH | Project Director: CK

BM STAGE: **PLANNING**

BM BARRETT MAHONY
Dublin Office: Sandwith House, 52-54 Lower Sandwith Street, Dublin 2, Ireland. Tel: (01) 677 3200 Fax: (01) 677 3164
London Office: 12 Mill Street, London SE1 2AY, United Kingdom Tel: (0044) 20 3750 3530
Consulting Engineers, Civil . Structural . Project Management.E-mail: bmce@bmce.ie Web: www.bmce.ie

CLIENT: 1 TERENURE LANDS LTD.

PROJECT TITLE: CARLISLE SITE KIMMAGE, RESIDENTIAL DEVELOPMENT
BM PROJECT No.: 21.221

CADD: REFERENCE | SUITABILITY | REVISION

DRAWING TITLE: SITE INVESTIGATION EXPLORATION POINTS

DWG: DRAWING REFERENCE: CST-BMD-00-ZZ-DR-C-1051 | STATUS: PL | REVISION: 4

Appendix 5

Addendum to Site-Specific Flood Risk Assessment

PUNCH consulting engineers

Carlisle Residential Development, Kimmage

Addendum to Site-Specific Flood Risk Assessment

242224-PUNCH-XX-XX-RP-C-0001

August 2024

Document Control

Document Number: **242224-PUNCH-XX-XX-RP-C-0001**

Status	Rev	Description	Date	Prepared	Checked	Approved
A0	C01	Planning Issue	16/08/2024	C. Shannon	C. Shannon	P. Casey

Master report template last updated 02/01/2024

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1 Introduction

1.1 Background

PUNCH Consulting Engineers were appointed by 1 Terenure Land Ltd to carry out a flood extent and depth analysis for the proposed Carlisle Residential Development at Kimmage Road West in Dublin 12. This analysis supplements the Site-Specific Flood Risk Assessment (SSFRA) Report prepared by Barrett Mahoney Consulting Engineers (BMCE) for the same development.

The proposed site layout is detailed in a series of planning drawings provided by BKD Architects in the planning documentation.

1.2 Existing Site

The subject site is located to the rear of Ben Dunne Gym Carlisle on Kimmage Road West in Kimmage, Dublin 12. The site is approximately 1.25 hectares in size and is located within Dublin City Council's remit. The proposed site is currently greenfield and is bordered by Ben Dunne Gym Carlisle to the south-west, and existing residential development to the north-east, south-east and north-west. The location of the site is shown in Figure 1-1.

Figure 1-1: Location of the Proposed development (site boundary indicated in red)

1.3 Nature of the Proposed Development

The proposed development comprises of 5 no. residential apartment blocks ranging in height up to 6 stories. An extract from the site layout drawing prepared by BKD architects is shown in Figure 1-2.

The development will be accessed via an existing access road from Kimmage Road West. This access road currently provides vehicular access to Ben Dunne Gym Carlisle. The location of the access road is shown in Figure 1-1.

Figure 1-2: Proposed Site Layout

2 Ground Level Data Review

2.1 Topographical Survey

A topographical survey of the site and its environs was completed by Land Surveys in September 2018.The survey extents encompass the site of the proposed development as well as the access road and levels along Kimmage Road West as shown in Figure 2-1.

The proposed development site is greenfield and generally slopes from west to east, with a high point of 47.5mAOD along the western boundary and a low point of 45.5mAOD along the eastern extent. Levels along the access road fall north to south towards Kimmage Road West with a high point of 46.6mAOD at the entrance to Ben Dunne Gym's carpark and a low point of 46.0mAOD at the junction with Kimmage Road West. Road levels along Kimmage Road West fall east and west towards a low point of 46.0mAOD at the junction with the access road.

The topographic survey has identified concrete footpaths along the access road and road gullies at regular intervals along both the access road and Kimmage Road West.

Figure 2-1: PCA Topographical Survey Extent

The topographic survey point levels were digitised and a ground surface generated in QGIS, an open-source Graphic Information System (GIS). This surface data is shown in Figure 2-2 below.

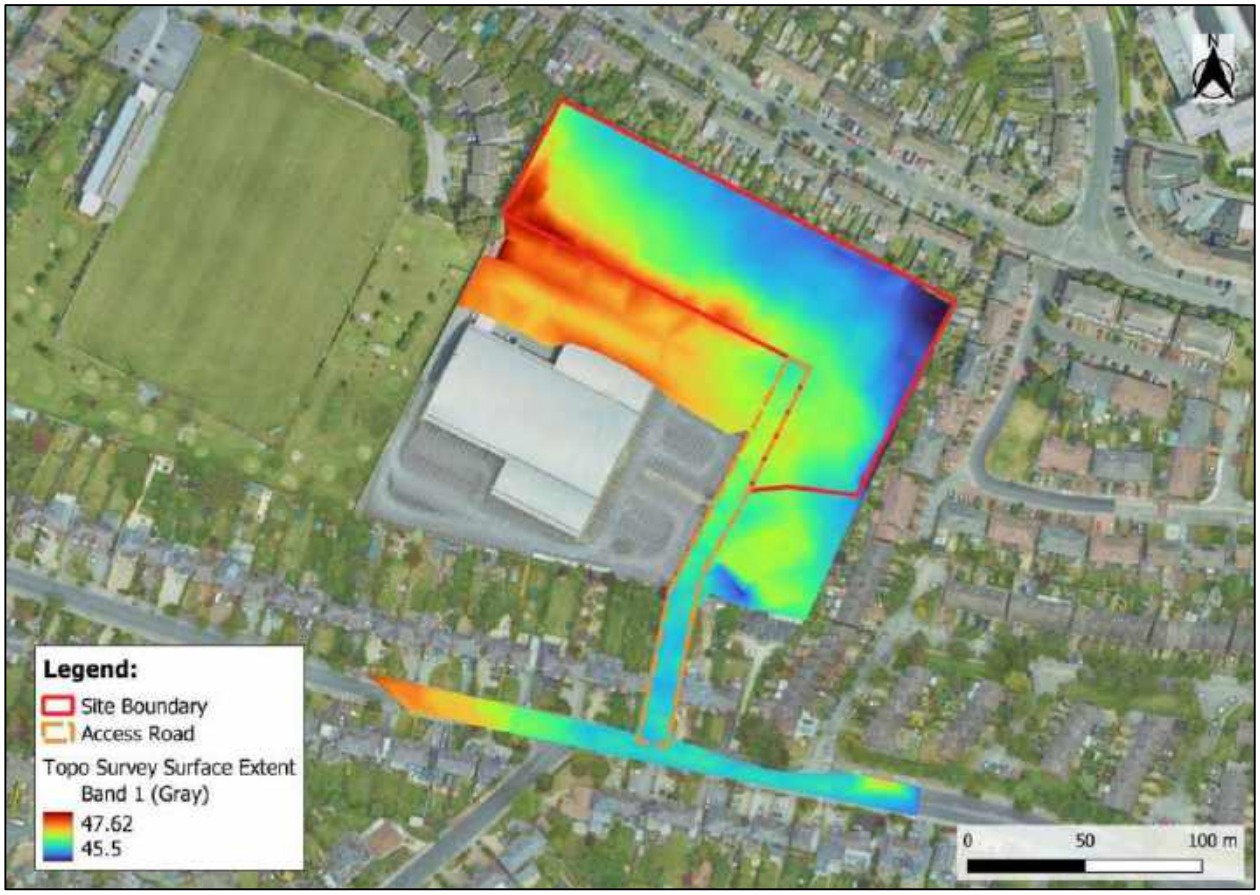

Figure 2-2: Digitised Topographic Survey Data

2.2 Digital Terrain Model (DTM)

Publicly available Digital Terrain Model (DTM) data was downloaded from the Open Topographic Data Viewer for the purposes of this assessment. The relevant DTM tile is labelled OPW_3181 and was procured by the OPW in 2011. This data has a 2m grid resolution with an RMS error of +/- 200 mm. It is worth noting that DTM data is a bare earth model with all buildings and trees removed. The DTM tile extent is shown in Figure 2-3.

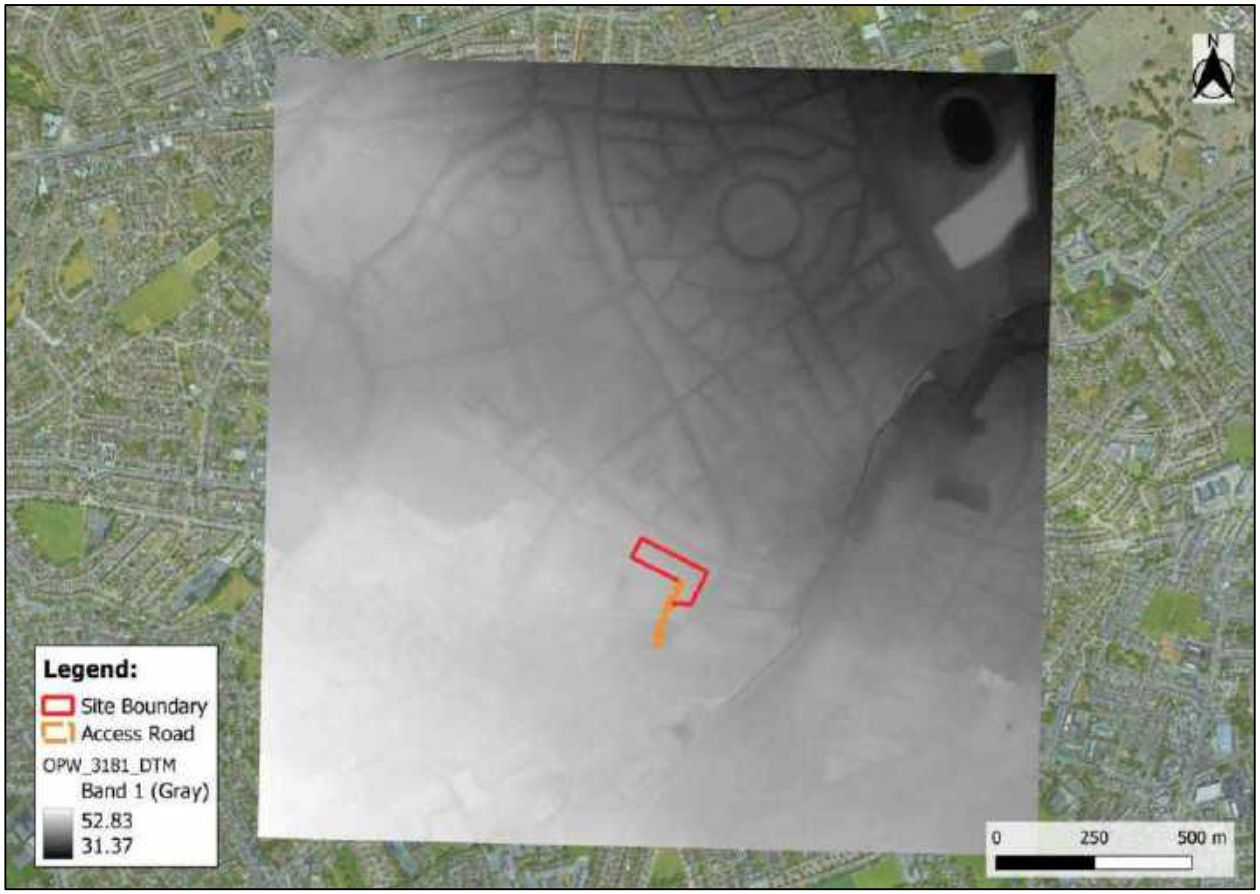

Figure 2-3: DTM Tile Extent

2.3 Ground Surface Comparison

The digitised topographical survey surface was compared against the DTM using QGIS and the differences in ground levels are illustrated in Figure 2-4. It can be seen from this image that the ground levels in the proposed development site show little variation in the central areas with some differences along the boundary. In contrast, the ground levels along the access road are shown to vary throughout, with the topographic survey surface higher than the DTM by between 50mm and 250mm.

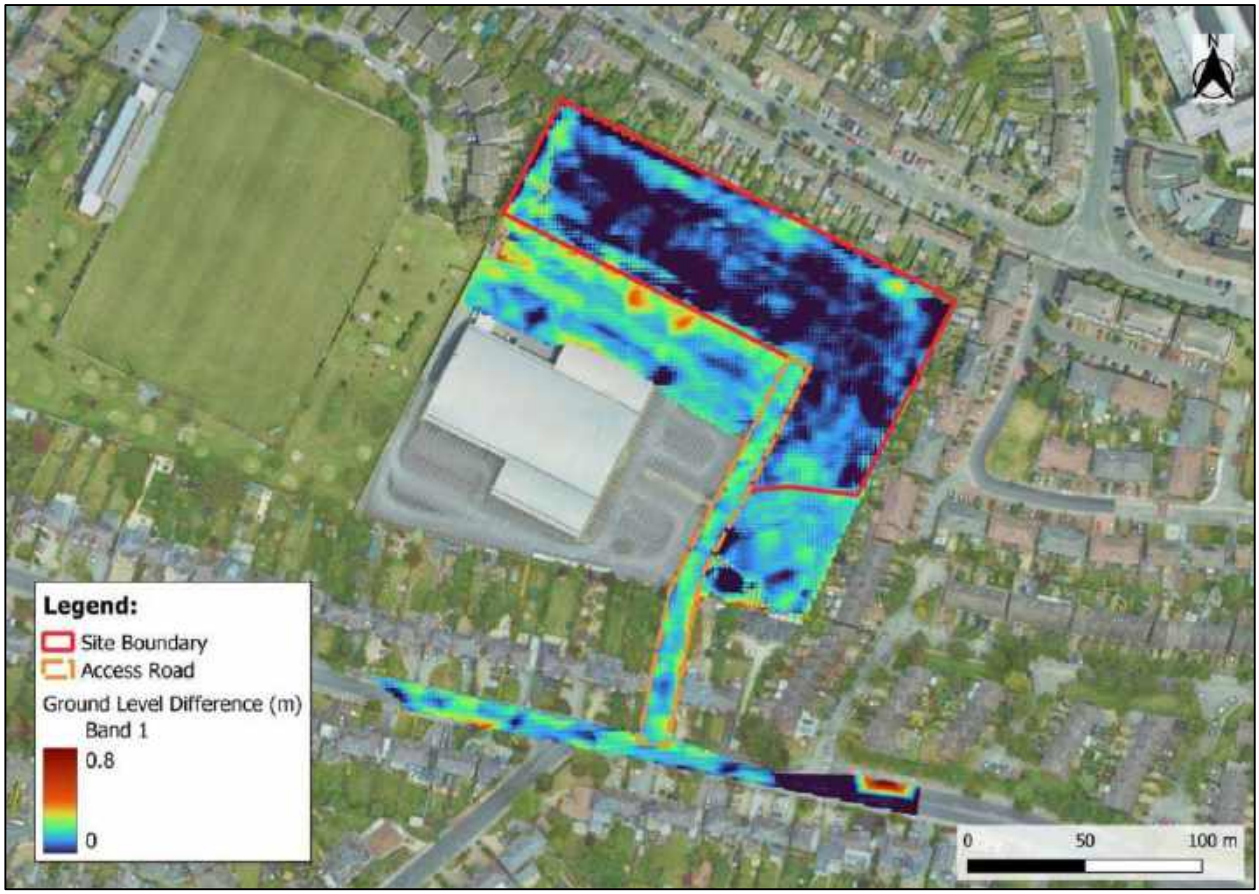

Figure 2-4: Ground Level Difference (Topographic Survey V DTM)

3 Flood Extent Review

The SSFRA report undertaken by BMCE for this development assesses coastal, fluvial, pluvial and groundwater flood risk to the site. This report concludes that the access road to the site is at risk of fluvial flooding emanating from the River Poddle. Three different fluvial flood extent maps were examined to ascertain flood risk as follows:

3.1 Catchment Flood Risk Assessment and Management Study (CFRAMS)

The CFRAMS is an OPW led national programme which seeks to identify and map potential existing and future flood hazard in areas at significant risk from flooding. It also aims to identify flood relief measures and prepare Flood Risk Management Plans for these areas.

The site of the proposed development is located in an area which has been assessed as part of the Eastern CFRAM Study (UoM 09). The OPW has published detailed flood hazard mapping for the area based on results from the CFRAMS. This includes flood extent and flood depth mapping for a number of return periods for fluvial and coastal flood events. The CFRAMS assessment in this area is based on hydraulic modelling of the Poddle River and associated tributaries.

Figure 3-1 below shows an extract from the relevant CFRAMS fluvial flood map. The CFRAMS use DTM ground level data to produce their flood extent mapping.

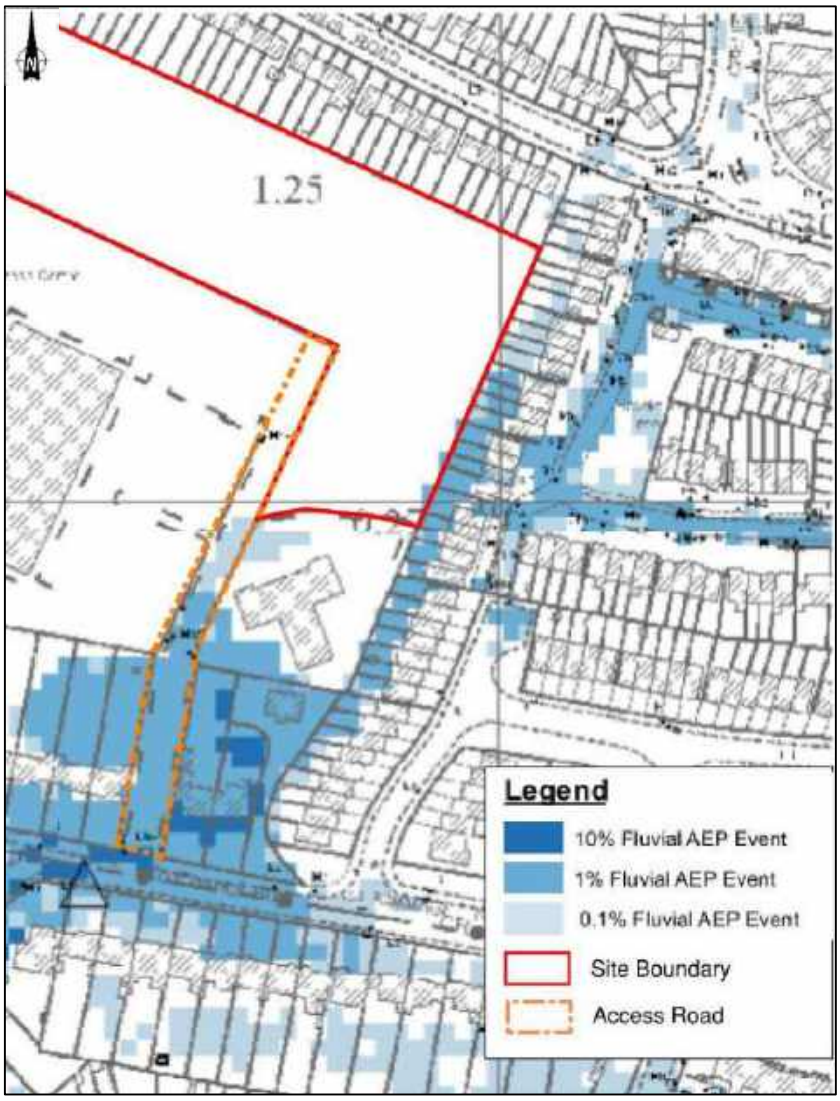

Figure 3-1: Extract from CFRAMS Flood Extent Mapping

3.2 Poddle Flood Alleviation Scheme

The Poddle Flood Alleviation Scheme (FAS) is currently underway and will protect properties at risk from the 1% AEP flood event. Figure 3-2 below shows the lands which will benefit from the scheme. The extent of benefitting lands equates to the 1%AEP flood extent. The Poddle FAS flood extent mapping was produced using DTM ground level data.

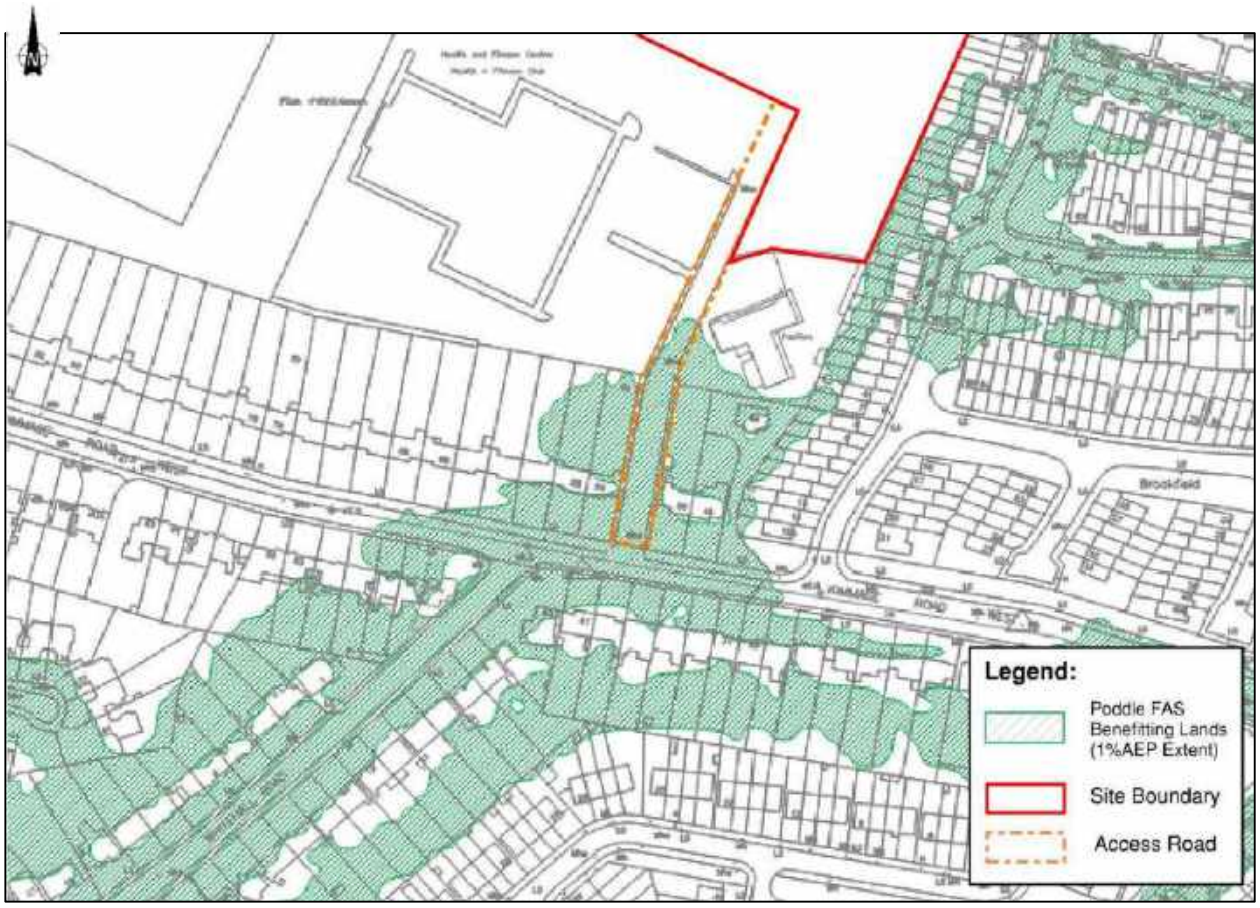

Figure 3-2: Extract from Poddle FAS Benefitting Lands Map (1%AEP Extent)

3.3 Dublin County Council Development Plan

The Dublin City Council (DCC) Development Plan (DP) Strategic Flood Risk Assessment (SFRA) provides flood zone mapping for the DCC area. Figure 3-3 below presents the flood zones in the vicinity of the site. The DCC DP SFRA mapping utilises the CFRAMS flood extents which were prepared using DTM ground level data.

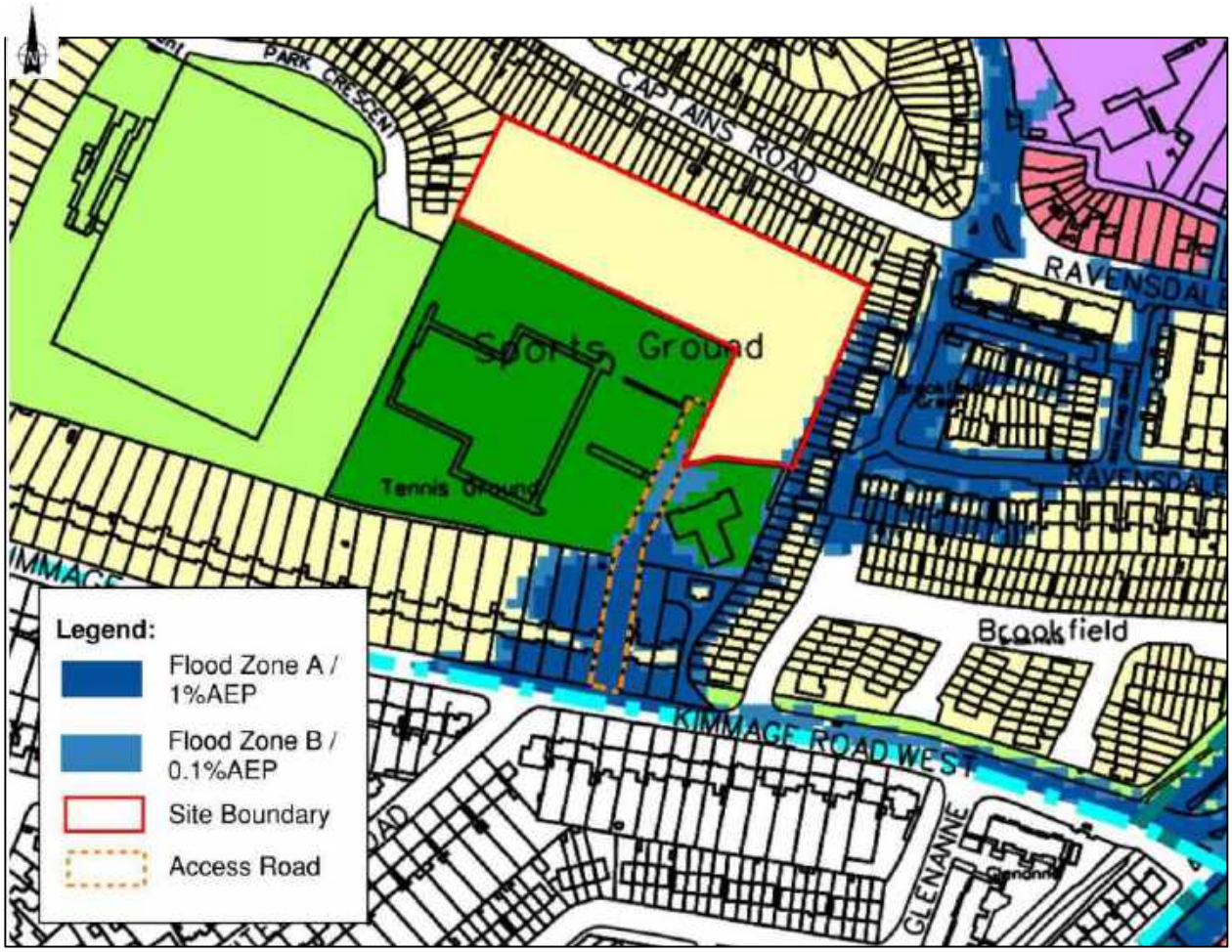

Figure 3-3: Extract from DCC DP SFRA Flood Zone Mapping

3.5 Design Flood Levels

The CFRAMS, Poddle FAS and the DCC DP SFRA flood extent mapping are all based on DTM ground level data and the flood extents in all three sources appear to be very similar in the vicinity of the proposed site. To ascertain predicted flood levels adjacent to the site, the 1%AEP and 0.1%AEP extents were overlain onto the DTM, and water levels estimated at points A, B and C (as marked on the Figure 3-4 below).

The resulting design water levels are presented in Table 3-1.

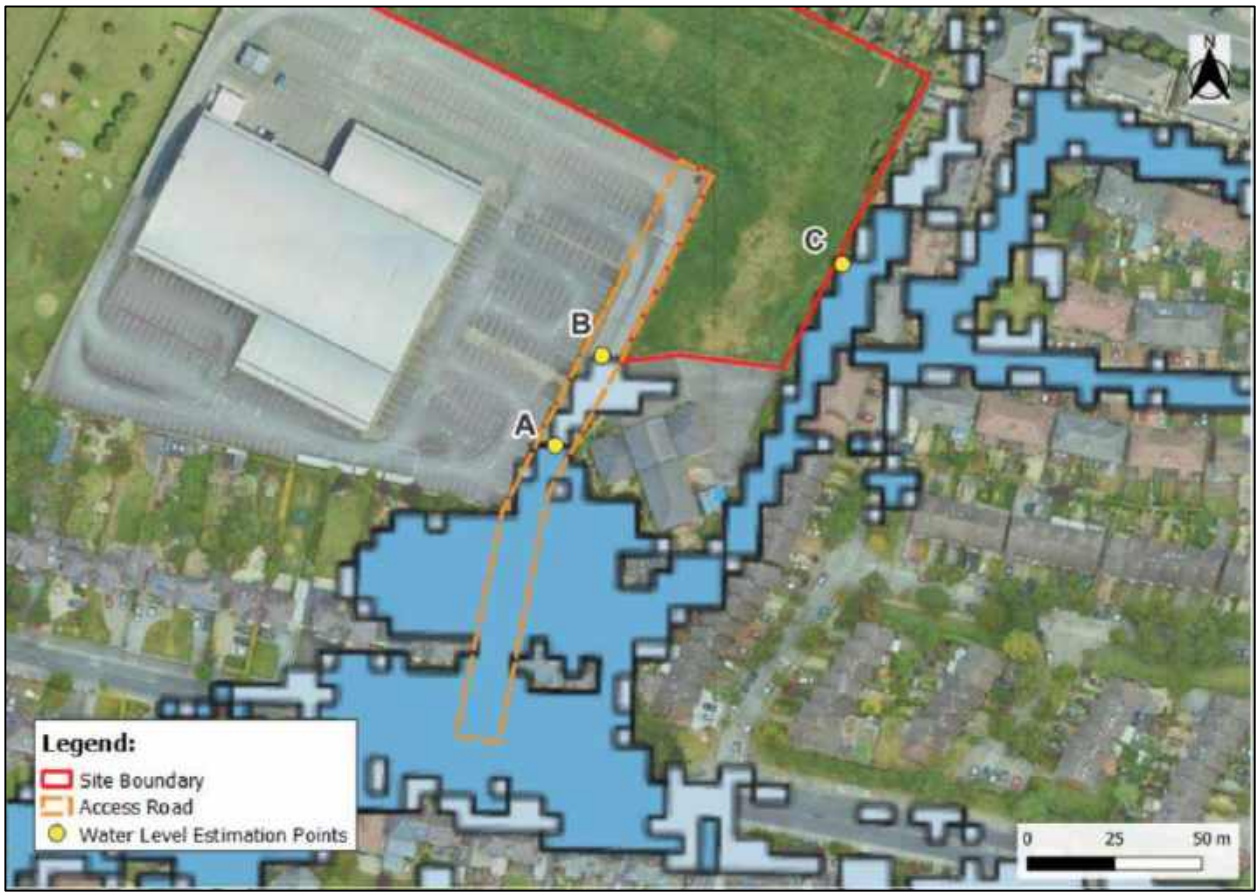

Figure 3-4: Water Level Estimation Points

Table 3-1: Design Water Levels

	Water Level (mAOD)	
Point	**1% AEP**	**0.1% AEP**
A	46.15	46.20
B	-	46.20
C	45.3	45.4

4 Revised Flood Extents and Depths

4.1 Flood Extents

To produce accurate flood extents in the vicinity of the site, the design flood levels presented in Table 3-1 above were applied to the topographic survey surface. The revised flood extents are presented in Figure 4-1 below.

Figure 4-1: Revised Flood Extents

The revised flood extents shown in Figure 4-1 are limited to the extent of the topographic survey surface (show in Figure 2-2). As such the full extent of flood risk to Kimmage Road West is not captured. It can, however, be seen that the 1%AEP and 0.1%AEP flood extents along the access road have been reduced and no flooding is present along the eastern boundary in either event.

4.2 Flood Depths

The depth of water during both the 1%AEP and 0.1%AEP flood events have been mapped in Figure 4-2 and Figure 4-3 below.

Figure 4-2: Revised 1%AEP Flood Depths

During the 1%AEP flood event, the maximum flood depth on the access road is 160mm. The majority of the flooding is less than 100mm deep with some pockets between 100mm and 150mm deep.

Figure 4-3: Revised 0.1%AEP Flood Depths

During the 0.1%AEP flood event, the maximum flood depth along the access road is 260mm. The majority of the flooding is less than 200mm deep with some smaller pockets between 200mm and 250mm deep.

5 Mitigation Measures

The Poddle FAS will defend against flood risk to the access road in the 1%AEP event including an allowance for climate change. It is estimated that this scheme will be completed by early 2026. Should the proposed scheme be advanced, the properties will not be occupied until 2026. No additional flood mitigation measures are therefore proposed for the 1%AEP event.

Following the completion of the Poddle FAS, a residual risk of flooding to the access road will remain in the event of defence overtopping or failure. In the unlikely event of such an occurrence, the site will be accessible by emergency vehicles as the predicted flood depths are well within fording depth limits[1] of 0.6m to 1.2m.

[1] As stated in the Internation Journal of Disaster Risk Reduction - Safety criteria for the trafficability of inundated roads in urban floodings.

6 Conclusion

PUNCH Consulting Engineers were appointed by 1 Terenure Land Ltd to carry out a flood extent and depth analysis for the proposed Carlisle Residential Development to supplement the SSFRA Report prepared by BMCE for the same development.

The SSFRA report undertaken by BMCE assesses coastal, fluvial, pluvial and groundwater flood risk to the site. This report concludes that the access road to the site is at risk of fluvial flooding emanating from the River Poddle. The flood mapping sources used to ascertain this flood risk are all based on DTM ground level data.

Topographic survey data and DTM data were reviewed and compared, revealing that the topographic survey ground levels are higher than the DTM throughout the access road to the site.

Design flood levels were estimated for the 1%AEP and 0.1%AEP events using predicted flood extents and DTM data. These flood levels were then applied to the topographic survey data and revised flood extents and depths developed.

The result of this analysis revealed that the revised flood extents are smaller than in the original flood extent drawings and the associated flood depth profiles have been refined.

The Poddle FAS will defend against flood risk to the access road in the 1%AEP event. It is estimated that this scheme will be completed by early 2026. No additional flood mitigation measures are therefore proposed for the 1%AEP event.

Following the completion of the Poddle FAS, a residual risk of flooding to the access road will remain in the event of defence overtopping or failure. In the unlikely event of such an occurrence, the site will remain accessible by emergency vehicles.

Barrett Mahony Consulting Engineers

Dublin:
Sandwith House,
52-54 Lower Sandwith Street,
Dublin 2,
D02 WR26, Ireland.
Tel: +353 1 677 3200

London:
12 Mill Street,
London, SE1 2AY,
United Kingdom
Tel: +44 203 750 3530.

Sofia:
19 Yakubitsa Street,
Lozenets,
Sofia 1164,
Bulgaria
Tel: +359 2 494 9772

WWW.BMCE.IE